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ABSTRACT

Presented in this volume are the results of the efforts of the staff of the Adult Learning Center of North Carolina State University to develop and validate a new concept in adult education. Intended to assist planners, teachers, graduate students and others who are faced with the task of applying educational solutions to problems of human learning, it will hopefully serve as a guideline for the organization and the deployment of functions, personnel, equipment, and methodology. Suggested resources and evaluation criteria are also presented. (Author/DB)

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GUIDELINES FOR ESTABLISHING AND OPERATING AN ADULT LEARNING LABORATORY

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ADULT LEARNING CENTER

The Adult Learning Center was approved and established as an experimental and demonstration project in adult basic education in 1967 under the provisions of Section 309(b) of the Adult Education Act of 1966. The Center is an integral part of the research and development program of the School of Education at North Carolina State University. The purpose of the project is the identification, development, and evaluation of innovative curriculum materials and instructional methods that will accelerate and enhance learning in undereducated adults. Special emphasis has been placed upon investigations into the utilization of modern educational technology for the instruction of undereducated adults. A major concern of the Center is the development of packaged instructional materials and improved instructional methods which are capable of being institutionalized within adult basic education programs in public school systems. The Center is totally committed to the belief that its projects and products must give promise of materially improving the ongoing adult basic education program at all levels, local, state, and national.

The Center is part of the program conducted under the Auspices of the Bureau of Adult, Vocational, and Technical Education, Division of Adult Education Programs, Office of Education, U. S. Department of Health, Education, and Welfare. The program of the Center cuts across the Schools of Education, Agriculture and Life Sciences, Liberal Arts, and Physical Sciences and Applied Mathematics at North Carolina State University at Raleigh.

CENTER EDUCATIONAL MONOGRAPH SERIES

The Educational Monograph Series has been established as a vehicle for the publication of monographs of general interest to people involved in all areas of adult education. For the most part, these monographs are written by members of the Center staff, as a consequence of their affiliation with the Center. It is the express purpose of this series to insure that such efforts on the part of those connected with the Center will be made available to a general readership, and not be restricted solely to the audience for whom they are initially prepared.

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GUIDELINES FOR ESTABLISHING AND OPERATING AN ADULT LEARNING LABORATORY

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ADULT LEARNING CENTER
NORTH CAROLINA STATE UNIVERSITY AT RALEIGH
RALEIGH, NORTH CAROLINA
JUNE, 1971

PREFACE

Observations of contemporary educational practices indicate that we are in the midst of an educational revolution. The impact of research-based educational technology is having an effect on all aspects of education, especially in the design of instructional systems for adults. New approaches to the education of adults have led to the development of the concept of a learning laboratory.

This concept of a learning laboratory, as an instrument of Adult Education, has evolved and been tested during the past three years at the North Carolina State University Adult Learning Center.

Believing that the philosophical and structural principles underlying adult learning-teaching should be in some way different from those of traditional education, the center staff that initiated the learning laboratory set out to employ the best ideas available from educational technology. The intent was to employ a broad new approach which would take into account those factors which are unique in the adult learning process. Functioning primarily within a research environment, the learning laboratory was to be a means by which programmed instructional materials could be evaluated. An extensive record system has been devised and drawn up for research purposes.

Out of challenging experiences in the day-to-day operations of a learning laboratory have come the ideas presented in this publication.

Presented in this volume are the results of the efforts of the staff of the Adult Learning Center to develop and validate a new

concept in adult education. Intended to assist educational planners, teachers, graduate students and others who are faced with the task of applying educational solutions to problems of human learning, it will hopefully serve as a guideline for the organization and the deployment of functions, personnel, equipment, and methodology. Suggested resources and evaluation criteria are also presented.

It is hoped that ideas from this publication will serve to stimulate further thought with regard to the learning center approach to adult education.

The original edition of Guidelines for Establishing and Operating an Adult Learning Laboratory was the result of the collaborative efforts of the following graduate research assistants at the Adult Learning Center:

Miss Mary H. Fisher

Mr. Cleve W. Lane

Mr. Robert B. Lewis

Under the supervision of Dr. Hazel C. Small, Area Project Director, those research assistants produced the first edition in October, 1970. Appreciation is extended to Dr. Small and those graduate research assistants.

The Center wishes to thank Mr. Joseph B. Carter, Coordinator of Learning Laboratories, North Carolina State Department of Community Colleges, for special consulting services provided during the development of this publication.

Appreciation is extended to the following people who reviewed the manuscript of the second edition prior to its publication:

Mr. Charles M. Barrett, Director, General Adult Education and Community Service Programs, North Carolina Department of Community Colleges

Mrs. Jane Curtis, Associate Director, Learning Foundations of Raleigh

Miss Martha I. Stephenson, former Learning Laboratory Coordinator, now Registrar, W. W. Holding Technical Institute, Raleigh, North Carolina

Dr. Ronald W. Shearon, Assistant Professor of Adult and Community College Education

The Center is particularly appreciative of the efforts of Mr. Robert B. Lewis and Mr. Cleve Lane, who worked so diligently to revise the original edition and thus make the present volume available.

In addition, thanks are due Mrs. Selma McEntire and Mrs. Wanda Tindle for their assistance in the preparation and reproduction of this monograph.

D. Barry Lumsden
Director

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CHAPTER 1

THE ADULT LEARNING LABORATORY

Definition

A learning laboratory is a flexible, self-contained learning system. As such it incorporates individualized, self-paced instruction through a format of programmed materials and uses a multimedia approach to provide learning experiences to meet the needs of each learner.

As the use of this instructional method has increased, the need for information concerning its features and operations has become apparent. Resulting from this need, Guidelines for Establishing and Operating an Adult Learning Laboratory was developed as an aid to those who are interested in establishing and operating an adult learning laboratory. To achieve this task, it is first necessary to make the reader aware of the distinctive features of this unique form of instructional environment, the assumptions upon which it is based, and its limitations as well as advantages.

Flexibility

The learning laboratory operates for the learner's convenience. The flexible feature of the learning laboratory is necessary to enhance the persistence of learners in the attainment of their personal educational goals. Learning laboratories are planned to maximize the freedom of learners to engage in new learning experiences and offer:

- Individual scheduling,
- Opportunity to enter a program of study at anytime,
- Year round operation,
- Extended hours to accommodate learner's life situations.

Self-Contained

As previously indicated, the learning laboratory is a comprehensive, self-contained learning system. Each learner is assisted by an educational coordinator in the selection of an appropriate program of study to fit his individual needs. To accommodate the needs of the various learners, a laboratory should provide:

- A variety of program content on varying educational levels,
- A choice of instructional media,
- A variety of learning experiences,
- Continuous evaluation of individual learner in units of instruction, programs, and educational goals.

Individualized, Self-Paced Instruction

Instructional programs are selected for the individual learner on the basis of the individual's stated educational objectives, beginning proficiency level, and personal preference for materials and media. Such individual attention allows each learner to proceed at his own rate, skip portions of programs in which proficiency can be demonstrated, or repeat segments of any unit as often as judged necessary. In prescribing individualized programs, consideration should be given to:

- Learner involvement in selection and planning,
- Sequence and continuity of the instruction,
- Repetition of the learning activities,
- Incorporation of appropriate media,
- Effective and continuous evaluation,
- Revision of programs when indicated by evaluation.

Programmed Instruction

Instructional sequences designed for a learner in an adult learning laboratory are provided through programmed instructional materials. These materials present the information or knowledge to

be learned and provide the learner the opportunity to demonstrate his knowledge.

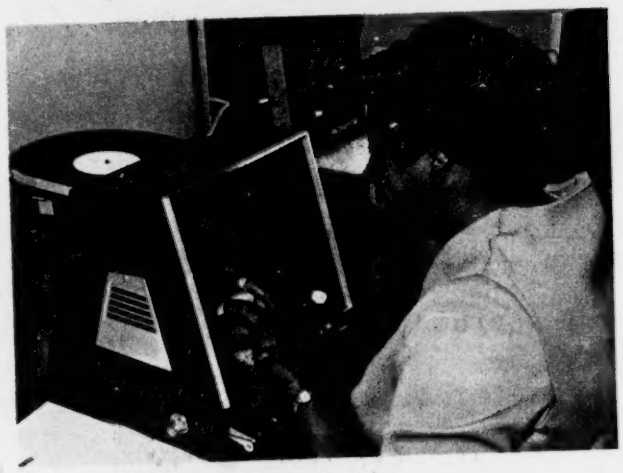
Programmed instructional material is generally characterized as follows:

- Assumptions are stated clearly in writing;
- Program objectives are explicitly stated in behavioral terms;
- Instruction consists of a logically ordered sequence of steps commonly referred to as frames;
- Overt responses are required of learners;
- Immediate feedback on responses is provided learners;
- Learners are provided with constant evaluation of their individual progress.

Multimedia

One of the most distinctive features of the learning laboratory is that various media may be incorporated as components of the instructional system, providing alternatives in designing learning experiences that are most effective in matching learner and content. Media may be classified into four general groups with several types available in each:

- Printed Materials
  - Books
  - Programmed Texts
  - Teaching Machines
- Graphic Arts
  - Slides
  - Pictures



Charts

Film Strips

Video Tapes

- Audio Materials

Tapes

Recorders

Radio

Cassette

Records and Record Players

- Audio-Visual Materials

Sound Motion Pictures

Television

Role of the Coordinator

The coordinator's role is that of a facilitator of learning who provides each learner with an appropriate instructional program. In this role the coordinator must be prepared to:

- Assess the learner's entry-level behavior,
- Identify the learner's educational objectives,
- Select appropriate instructional programs,
- Assist the individual in establishing a realistic and productive study schedule,

- Provide a positive attitude toward the learner's ability to succeed,
- Help the individual understand the relationship between his educational goals and his learning rate,
- Make continuous evaluation of, and improvement in, the instructional process.

Assumptions

A successful learning laboratory operation requires an awareness and acceptance of certain basic assumptions upon which the learning laboratory is predicated. This acceptance must be made both by the coordinators actually working in the laboratory and the administrators that support such an endeavor; therefore, careful consideration should be given to the manner in which a laboratory will fit into the overall educational philosophy of the institution.

The assumptions are that:

- Every individual can learn;
- Some learners will require more time to master skills than others;
- Motivation is increased by successful and pleasurable learning experiences;
- Failure of a learner to reach objectives may be a reflection on the instructional materials and the coordinator rather than the learner;
- All instruction should be based upon behavioral objectives;
- Programmed instruction is an effective mode of instruction;

- Technology should be an integral component of the instructional system;
- A coordinator is primarily a manager of learning experiences, not a disseminator of information;
- Evaluation is for the purpose of improving instruction and enhancing learning, not a method of penalizing the learner;
- Learning is a continuous, life-long experience.

Advantages and Limitations

The learning laboratory is not represented as the panacea to the problems of contemporary education. It is, however, an instructional system that has definite advantages which make it valuable in the total educational system, and it has proven effective with adult learners.

Advantages

- Every learner can experience success;
- Every learner actively participates in the learning process;
- Curricula can be tailored for each learner;
- Every learner receives instruction to meet his own needs;
- Every learner controls the pace of his own learning;
- Every learner is involved in planning his own program and selecting his materials;
- Because scheduling is flexible, no one ever misses part of the instructional sequence due to non-attendance.
- The instructional system can provide an almost limitless variety of programs.

Although the advantages are multiple, it would be misleading to imply that the programmed instructional approach to learning is without limitation. Since the approach does differ from that of the traditional classroom, new roles must be assumed both by teacher and student; new materials will be required to fit learner needs; and a sufficient staff will be needed to maintain a proper learner-coordinator relationship.

Possible Limitations

- The learning laboratory requires a re-orientation to the role and functions of the "teacher".
- Orientation of students to the methodology is necessary since they have generally been "taught" in a traditional classroom setting.
- The transition from the role of "passive learner" to that of "active learner" is difficult for some students.
- In many cases, no provisions are made for group discussion.
- Provisions for socialization needs are frequently not made.
- Sufficient individual attention requires a low learner-coordinator ratio.
- There is a shortage of validated programmed materials particularly appropriate for adults.

The potential of the learning laboratory can be evaluated best by a careful comparison of the advantages with the possible limitations. Therefore, it is stressed that the guidelines presented in the present volume are not intended to dictate rigid structural requirements. They should serve instead as a basis for the

formulation of an operation. Modifications are expected and necessary as the concept is adapted to meet the needs of a variety of programs.

Factors in Planning an Educational System

Effective educational systems are those which are developed to meet identified needs of particular learner populations and which incorporate appropriate instructional processes to meet those needs. The following questions may be used as a guide to planning a new program, or they may serve as criteria for judging existing programs:

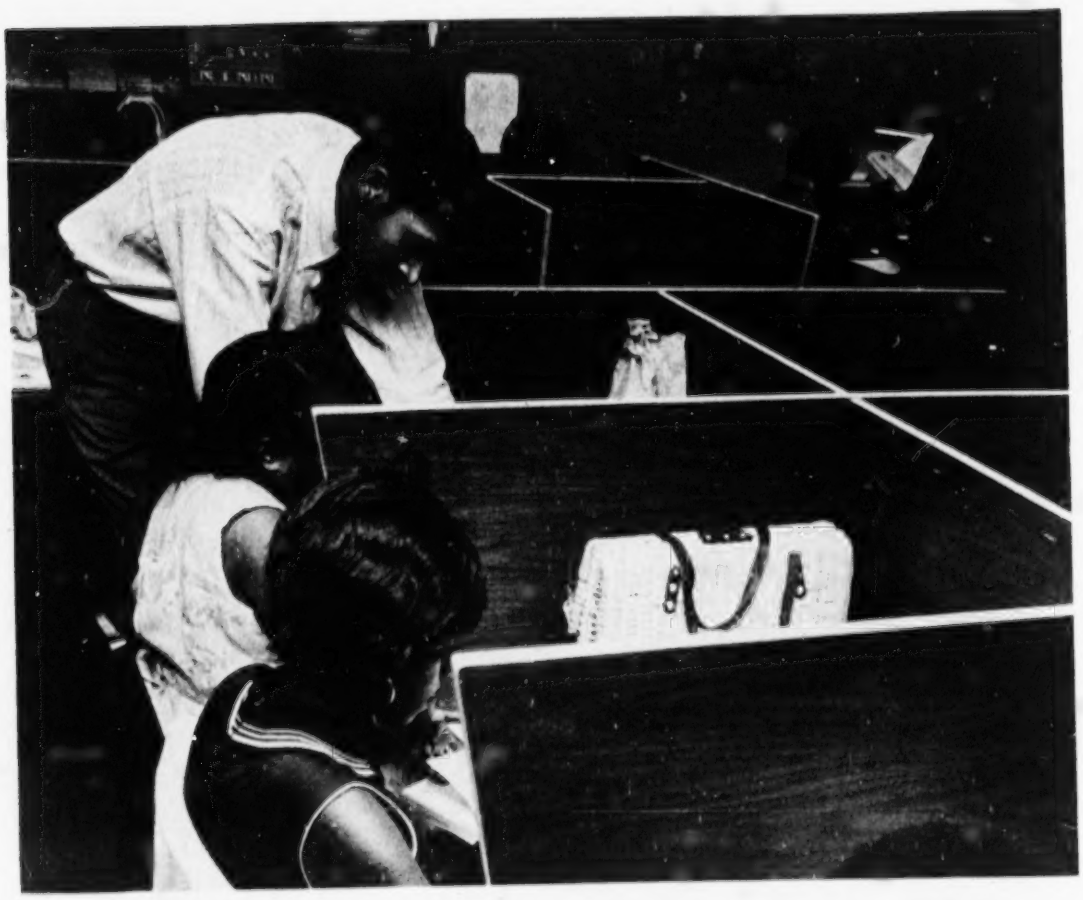
- Have specific learning objectives been stated that explain what the learner is to know, do, or feel as a result of his learning experiences?
- Have methods for evaluation been selected that will indicate the degree to which the learner has achieved the stated objectives?
- Have the learners' characteristics and capabilities been adequately identified?
- Will the planned instruction produce the desired types of performances?
- Were all alternatives that could lead to achievement of objectives identified before selection of content and media?
- Has a method of evaluating program effectiveness been planned?

Summary

In this section the learning laboratory was defined and a broad framework of understanding from which the method to proceed was established. The following chapters will identify and discuss in detail the various component parts that fit together to form an operational adult learning laboratory. Emphasis will be placed on the various phases of the learning laboratory process as vehicles directed toward the attainment of the learner's objectives and goals.

CHAPTER 2

QUALIFICATIONS AND RESPONSIBILITIES OF THE COORDINATOR



Introduction

In the laboratory operation the coordinator is the central figure, for it is this individual who interacts with the learners, tailors programs to fit their needs, and supervises general daily operational activities. Since the learning environment in a laboratory is not basically comparable to the traditional classroom, it is essential

that a coordinator realize the extent and variety of the responsibilities involved and know what qualifications are required for effective performance.

Qualifications

A question of major concern regarding the operation of an adult learning laboratory operation is, "What personnel qualifications are necessary to successfully function in this unique instructional situation"? Because of the relative newness of this educational approach, there is scant literature dealing with the subject of a coordinator's qualifications, so any recommendations made must necessarily be based on the experience and perception of practicing coordinators. Recommendations presented here should not be viewed as a standard but as guidelines for assessing the individual situation.

In general, it is recommended that a coordinator:

- Have a knowledge of the culture of the adult population(s) for which the laboratory is designed,
- Be familiar with the needs of adult learners,
- Understand the principles of programmed instruction,
- Be knowledgeable in basic learning theories,
- Have experience in the application of various teaching techniques,
- Be knowledgeable in self-instructional techniques,
- Be well-organized and adaptable,
- Be able to solve educational problems and make related decisions.

Based upon the foregoing list of recognized skills, three major classifications may be identified for the purpose of establishing tentative qualifications for learning laboratory coordinators. These are professional qualifications, academic qualifications, and personal qualifications.

Professional Qualifications

As a professional educator, the learning laboratory coordinator is expected to have, or develop, competencies consistent with the tasks that must be performed. A knowledge and understanding of pertinent learning theory is necessary if the coordinator is to effectively apply in the instructional situation teaching techniques that will provide valuable learning experiences for the learners. A knowledge of the techniques of self-instruction and of instructional design is required in order to insure that proper application is being made of the theory. Although not usually considered an aspect of professional preparation for teachers in general, for the coordinator dealing with adults, a working knowledge of the techniques of counseling is an indispensable tool. This is so because many laboratories will not have a professional counselor available and because the majority of adults are more likely to seek counseling aid from an instructor they know and like than from a counselor with whom they are not acquainted.

For the instructor of adults in an individualized instructional setting, previous teaching experiences may or may not be an asset. Public school teaching experience, for most teachers, represents a

very different type of instructional process and educational situation from that which the coordinator will encounter. Attempts to adhere to the traditional classroom approach or to the techniques used with children may lead to a disappointing and frustrating experience when dealing with adults. Recognition of the differences in the two situations and in the two sets of learners is essential so that the coordinator will not try to extend the experiences and training, as valuable as they may be, into an inappropriate setting.

Academic Qualifications

Suggestions for the type of academic background valuable for a coordinator vary; however, it is strongly recommended that this background be one that acquaints the coordinator with the unique conditions and characteristics of adult learners in general, and with the cultures of particular adult populations engaged in instructional programs. Therefore, in addition to courses relevant to teaching as a profession, a coordinator's academic training will be enhanced by an emphasis in the behavioral sciences, including courses in sociology, anthropology, psychology, and counseling.

Personal Qualifications

In dealing with adults, especially those who may have beliefs, attitudes, and needs differing significantly from those of the coordinator, the ability to relate to the learner is as important as any skill in instructional technique or knowledge of subject matter. Inherent in establishing a workable relationship is a sincerity that will be evident to learners. Lack of concern for the learners' goals

and needs will result in minimizing, and at times nullifying, the effects of the learning experiences in which they participate.

In addition to his sincerity and ability to empathize, a coordinator must be a flexible individual who can adapt to the varying situations that develop as a result of the individualized instruction situation. This situation also demands that the coordinator be well organized in order that the learning process can proceed efficiently.

In general terms, a coordinator must be a person capable of solving educational problems resulting from working with a number of learners with varying backgrounds and ability levels, as well as implementing the solutions to those problems on a personal level with the individual learner.

Recommendations

Based upon these identified needs for successful performance as a coordinator, the following recommendations are presented as tentative guides for establishing positional qualifications:

1. A minimum of a bachelor's degree, and preferably a master's degree, in a behavioral science, including at least one course in each of the disciplines of sociology, anthropology, and psychology.
2. Professional courses in education dealing with:
   - Learning Theory
   - Instructional Design
   - Programmed Instruction
   - Multimedia

- Counseling
- Teaching Methods

3. A teaching credential in Adult Education.
4. Demonstrable evidence of concern and awareness of the problems and conditions of the undereducated and underprivileged adult.

Responsibilities

The responsibilities of the coordinator are somewhat different from those of the typical classroom teacher. The learning laboratory, viewed as a self-contained learning unit, places numerous and varied responsibilities on the coordinator. Direct assistance to the learner and various instructional activities are the central duties of the coordinator. Other duties that are part of the normal daily operation place the coordinator in the role of an administrator. The degree of involvement with students in areas outside the formal learning process will vary, depending upon the organizational structure of the learning laboratory, but will impose some responsibilities, especially in counseling, depending upon whether the learning laboratory operates as a separate unit or as a part of a larger educational institution such as a community college, a military education center, or a library. Also, administrative duties necessary to conduct the learning laboratory operation often become an integral part of the daily activities with which the coordinator finds himself involved. What follows, then, will be a consideration of those varied duties recognized as necessary in the operation of a successful learning laboratory.

Coordinator of Learning Activities

The primary duty of the coordinator will be concentrated in assisting the learner toward his goals. The concept of individualized, self-instruction is the central feature of the learning laboratory; however, each learner will require direction and guidance in his learning experiences. The coordinator is concerned with the learner's involvement in meaningful and constructive interaction with both media and materials as they pertain to the behavioral objectives specified in the educational units and overall program.

Instructional Design. In Chapter 3 attention will be given to the role of the coordinator as the designer of the individualized, self-instructional programs. The implementation of the program development model for each student as depicted in Figure 5, page 63, is a necessary function that must be prescribed for each learner. Without the curriculum program the learner would not have a course of study to follow. The coordinator is the only one both qualified and responsible for the educational program becoming an operational endeavor. The confidence and ease by which each learner is approached and introduced to the instructional program will reflect the personal effort and interest demonstrated by the coordinator. Thus, designing and implementing the instructional program becomes the key responsibility of the successful coordinator.

Learning Facilitator. The coordinator is the agent by which learning is facilitated for the laboratory clientele. The student is the only one who can learn; the coordinator is his greatest source of assistance in this process.

Each student's situation will present different circumstances with which the coordinator must deal. Knowledge of the students and their needs will help each coordinator choose the best combination of means and aids to help in this new experience. Programmed instructional courses of study are the basic means of study found in the learning laboratory. The coordinator is responsible for introducing the student to his first contact with programmed materials. This initial contact should be in a one-to-one situation with the coordinator demonstrating the proper usage of the materials. The time devoted to this orientation is important inasmuch as it may determine the learner's acceptance or rejection of this type of material. The idea usually conveyed is that the learner who follows the directions will be able to work independently, at his own pace, with no limits, and he can expect to be a successful learner. Proper orientation and allowance of sufficient time is very important if the student is to become confortable and familiar with programmed instructional materials. To reinforce his ideas, a practice lesson under the watchful eye of a coordinator is most helpful if a friendly smile and an overt interest in helping the student is a part of the atmosphere that prevails in a learning laboratory.

Tutor. The term "tutor" refers to a continuous one-to-one type of assistance for a learner who needs help with a course of study. This function may be necessary to help the learner understand certain concepts, points, or processes in the instructional program. The coordinator will often find it necessary to take a learner to his office or to a chalk board to enable the particular problem to be

solved. The time required may be only a few minutes at the learner's carrel or several sessions over a period of time.

Numerous techniques may be used to help the learner in the one-to-one situation. Each coordinator will develop certain means that will help demonstrate how to approach certain problems as they pertain to the learner's instructional program. Brief examples follow:

- The use of the dictionary,
- The use of pennies and other coins to illustrate the concept of fractions,
- A simple explanation in layman's terms of a point or situation in the programmed material,
- Helping the student reason out why certain things happen in reference to the previous lesson.

The coordinator will find that student needs for individual help will vary with subject matter areas, levels of achievement, and degrees of difficulty. The amount of time spent with students will depend entirely upon their needs, and the coordinator-student ratio, so there will likely be times when help is sought from someone better acquainted with the particular problem at hand. Regardless of the conditions, it should be recognized that the tutoring responsibility of the coordinator is very much a part of the total learning process.

Group Discussion Leader. The use of a learning laboratory is not limited only to the use of individualized, self-instructional programs of learning. The coordinator may frequently find opportunities to generate interest in group discussions. The discussions will usually center around a topic related to a particular course of study or the

occurrence of an unusual event. The coordinator is encouraged to make available both the opportunity and space for group interaction since this may serve as a valuable supplement to the learners' regular program.

To encourage more group sessions the coordinator should attempt to organize groups that have special interest or a general interest in just getting together to share experiences. Several ways of encouraging this type of student involvement are:

- Discussion following a presentation on educational T.V.,
- Discussion following a presentation of a film of interest,
- Discussion of local or national current events,
- Discussion of current topics of general interest such as travel, photography, gardening,
- Discussion following a formal presentation by an invited speaker,
- Discussion following a presentation on any topic relative to a group's program of study.

Group discussions give students a chance to become better acquainted with their peers, to engage in socialization, to explore new areas of interest, to establish confidence in self-expression, and to provide many new learning experiences which may or may not be directly connected with the person's individualized program.

The coordinator's responsibility is significant in this area as the learners will look to him for leadership; however, learners should also be allowed to become involved and assume responsibilities for promoting and participating in these group-centered events.

Provider of Materials and Media. If a coordinator is to effectively facilitate learning in an individualized instructional system, care must be exercised in planning for the dispensing and allocating of materials and media. In this setting, the learner is entirely dependent upon the availability of the prescribed materials and the appropriate media. Without these, instruction ceases.

Open-shelf storage of materials and media is preferable; the coordinator can make instructional assignments and then place the responsibility on the individual learners to actually get the necessary items. This approach serves two useful functions. First, the coordinator is free from the task of actually retrieving and dispensing these items to each learner--a task that can consume large amounts of time during the course of the day's activities with a large group of learners. Second, this approach indicates a trust and confidence in the learner--a trust in his honesty and sincerity, and a confidence in his ability to work on his own--both of which are important to improving the self-concept of the adult learner.

However, it is still the coordinator's responsibility to see that learners are adequately supplied, and coordinators should be prepared to help solve problems or conflicts that may develop from different individuals needing the same materials or media at the same time. Careful forethought concerning limitations of media and materials and well-developed plans for organizing instruction will forestall many problems of this type.

Evaluation

The coordinator is the person responsible for the evaluation of learner achievement at all stages of the instructional process. Because of the importance that evaluation has in the development of motivation and the individual's self-concept, measurement of progress will need to be made at the unit, sequence, and program levels.

One of the underlying assumptions of the learning laboratory is that every individual can learn, and one method of insuring that the learner is encouraged in his learning attempts is to provide prompt feedback on progress by the immediate grading of tests, exercises, problems, and other similar materials. Such prompt response on the part of the coordinator is a method of positively reinforcing the learner. Even when the work is unsatisfactory, as it may frequently be, prompt recognition of the learner's situation and an evidence of concern will help to alleviate his fears

as well as making corrections or explanations more appropriate and meaningful.

Although an important function, the evaluation of learners is not the only responsibility of the coordinator in the area of evaluation. Program assessment is also vital to effective operation. A continuous assessment of program effectiveness should be designed and carried out by the coordinator so that programs that do not make a worthwhile contribution to the instructional process can be discarded and so that more effective programs can be instituted.

Evaluation of the overall effectiveness of the learning laboratory should also be conducted by the coordinator. This will involve both the evaluation of the materials (refer to Appendix C for details on materials evaluation) as well as a periodic review of the achievement of learners as a method of assessing the validity of the laboratory program.

Materials Development

Many of the materials and media today are the results of the efforts of coordinators to discover more effective learning programs. Coordinators are encouraged and expected to be innovative and creative in material development. New ways of making learning more meaningful are always needed and every idea should be explored. Coordinators may have difficulty finding the necessary time for this responsibility, but it is a beneficial contribution that serves both to improve the laboratory's program and to improve the coordinator's knowledge and competency. For those interested in material

development, Appendix B contains a detailed presentation on the development process and Appendix C describes in detail the evaluation of materials.

Administrative

The primary responsibilities of the coordinator cover a range of duties that are directly related to the learner and the learning process. The coordinator has another area of responsibility that is important in carrying out the teaching and counseling functions. A number of administrative duties have been identified that contribute to the smooth operation of the laboratory.

A laboratory may be a self-contained unit or attached to a parent organization. In either case, responsibility must fall on some person(s) for the training of personnel, recruiting of learners, public relations, and other varied duties as they exist for each particular situation. The concepts to be discussed here are general so as to enable the reader to apply them to the situation in which his laboratory will function.

The size of learning laboratories, schedule of operations, and student loads will vary. The result of these and other variables may make it necessary to have several coordinators working on a schedule to meet the requirements of the institution and its body of learners. The responsibility for the operation, coordination, and administration of the learning laboratory is usually placed upon a coordinator who has been designated as the director, head, or some other title denoting responsibility.

The coordinator in charge of the operation of the learning laboratory will find it helpful to look to his co-workers for input to the problems and duties of administration. Involvement of the coordinators in decisions that affect the daily operation will be most useful in directing a coordinated effort toward providing for an effective organization. Good communication, understanding, and cooperation are key elements to the efficient operation of the learning laboratory in regard to the schedules, records, and reports that must be made, supervision of personnel, recruitment of learners, in-service training, public relations, and the purchase of supplies, materials, and equipment.

Schedules, Records, and Reports. The coordinator is responsible for schedules, records, and reports for each student and for the general operation of the laboratory. The work schedules are a vital part of the operation in terms of the maximum utilization of space and materials as they are coordinated to fit the learner's needs.

The information supplied by careful record keeping is useful in preparing of reports necessary to obtain and maintain the financial support of the laboratory operation. Accuracy and comprehensiveness in scheduling, recording, and reporting of the laboratory operations cannot be stressed strongly enough.

Justification of new programs and laboratory expansion can be objectively presented if it is based on accurate and complete records. Various ways of recording activity for reports may be by:

- Average daily attendance
- Average hourly attendance

- Number of learner-coordinator contact hours
- Cost per student contact hour
- Ratio of students to coordinator
- Programs completed by learners

Adequate records should not become a burden but rather a justification for growth and improving service. The end product of complete records and reports will mean a better laboratory and better instruction for the learners.

Supervision of Other Personnel. The coordinator in charge of the laboratory cannot work alone with the flexible operating hours and learner scheduling that is encouraged, yet a coordinator must be in charge of the laboratory at all times when open to learners. To provide for this service, several aides may be required. Supervision of coordinators, aides, or volunteers is an administrative responsibility required for proper staffing and continuous operation. Close personal contact, continuous dialogue, and team coordination will allow need for minimum supervision. Direction of other personnel is necessary only as needed to maintain open communication and understanding as it applies to the instructional goals of the learners. Brief, but frequent, staff meetings at convenient hours are recommended as a part of the exchange of ideas, information, and direction from the coordinator in charge.

Purchasing. An additional administrative function that is performed by many coordinators is the purchasing of supplies, materials, media, and related equipment. To perform this function effectively, a coordinator should design a systematic approach for

making decisions relative to the purchase of any of the aforementioned items. Such an approach should be based upon a close examination of the learners' program needs and the laboratory's program objectives as well as a consideration of budgetary limitations. Decisions to purchase should be made only after a careful review of the available alternatives has been made. Many commercial vendors have well-informed and knowledgeable representatives who will provide information on their products. However, it is beneficial to have a standard procedure established for a comprehensive evaluation of items representing major expenditures, such as instructional materials and media equipment. Chapters 4 and 5 discuss in detail evaluation methods for the purpose of selecting both instructional materials and media.

For consumable supplies which have to be reordered on a periodic basis, the coordinator will usually be responsible for maintaining an inventory and for placing requisitions for needed items. A system for replenishing these consumable supplies should be worked out in detail so that it can become routine procedure. The system, however, should allow for local requisition processing, rate of consumption of supplies, and for reasonable delivery time. The better the planning of this system, the more time will be saved in making periodic orders.

Recruitment

Each coordinator is charged with a responsibility for providing information about the learning laboratory as a method of seeking out persons who could benefit from the laboratory opportunity for learning. Providing information in an honest and sincere manner that

reflects the philosophy of the laboratory will do much to attract new learners.

Reaching the individuals and groups who need and could benefit from the opportunity of the laboratory will take the coordinator across many cultural lines. The coordinators will need to be prepared to spend time outside of the laboratory "telling the laboratory story" as a part of their regular duties. Bringing new learners to the laboratory will require helping potential learners change their attitudes and beliefs about the value of education. Helping others see that the concept of the learning laboratory is unlike the traditional school program is important, for they must come to view learning as a practical means of achieving a new way of life through their own effort and motivation.

One of the most effective means of attracting students is by word-of-mouth contact from those students already enrolled and students who have satisfactorily completed their program, GED, or other goal. The students enrolled usually are very free in expressing their enthusiasm to friends and neighbors about this opportunity and their aid in developing a successful recruiting program is invaluable.

Recruiting new students is a necessary process and should be an on-going one that follows a systematic plan for reaching as many of the potential learner populations as possible. The aid of other organizations, such as churches, businesses and industries, social agencies, and other educational institutions, should be enlisted in the planning, developing, and implementing of a successful recruitment program.

Public Relations

The broader responsibility of providing information about the learning laboratory will be in the public relations program. A continuous and dynamic program of public relations will be advantageous in the recruitment of new learners as well as helpful in securing or maintaining community support for the institutional program.

Many opportunities will present themselves every day to tell others about the learning activities at the laboratory. The coordinator should be prepared to meet with both individuals and groups who visit the learning laboratory. Invitations may be received to speak before various lay and professional groups. To properly handle these duties, the coordinator must have sufficient time to prepare interesting and informative presentations about programmed instruction, individualized, self-paced instructional programs, and the use of various media. Demonstrations, when feasible, are most useful in making presentations before groups.

A constant flow of information to the general public through the various means and media is essential.

Opportunities for telling the story of the adult learning laboratory will present themselves through the following means:

- Radio and TV programs, spot announcements.
- Newspaper articles concerning programs, learners, activities, etc.
- Speaking engagements before civic clubs, church groups, etc.

- Professional meetings through both attendance and program participation.
- Newsletters to students, related agencies, industry and other interested groups.
- Contact with educational institutions, agencies, and divisions at the state and local levels.
- Contact with agencies such as the state employment office, welfare office, federal self-help programs, etc.
- Other sources as may be identified by observing the source of students presently enrolled in the laboratory.

A well-planned and well-executed public relations program will play an integral part in supporting and enhancing the recruiting program. Also, a public relations program is useful in broadening the base of community support for the parent institution as well as the learning laboratory.

Training

As a coordinator in a learning laboratory finds it necessary to seek additional help, the question of training new coordinators becomes relevant. What experience should a new coordinator have in the pre-service orientation before coming into contact with learners?

New coordinators are presumed to have met certain basic requirements, but may or may not have a concept of what the position involves. The coordinator in charge has the responsibility of providing a proper

introduction to the laboratory, to its media and materials, and to the learners. A sufficient amount of time to allow the new coordinator to become familiar with the basic undergirding concepts of individualized, self-paced instruction through the use of media and programmed instruction is imperative. A new coordinator might spend the first few days reading and studying about the philosophy of a learning laboratory as it applies to the open-door policy and everyone's right to learn. Time is also needed for an understanding of the concept of behavioral objectives as it pertains to programmed instruction to be developed. Study will also be required about the individualized, self-paced instructional program as it is designed by the coordinator for each learner. Also, the importance of success and immediate evaluation as a reinforcement to learning must be stressed. The foundation of the learning laboratory is based on the principle of the ability of everyone to learn at his own pace in a non-competitive situation.

The coordinator will need to become familiar with the cross section of economic levels and the various cultural, social, and racial backgrounds of learners represented. This will take time and will require working with learners to fully realize what is really meant by this relatively new educational pattern.

Not only are watching, helping, and listening important, so is experience in working out a unit of instruction in the various programmed material used with learners. To actually experience the sequenced instructional program frame by frame is a necessary learning experience for the coordinator. Knowledge of the uses of

the materials and the various media, including the full range of audio-visual support equipment, will be a prerequisite to the new coordinator's first encounter on a one-to-one basis with learners.

The pre-service training and orientation will set the background for the development of a coordinator. Only through experiences and feeling free to ask questions will the new coordinator ever develop into a valuable addition to the staff. Thus, the help and treatment shown a new coordinator should be similar to that shown a new student.

Opportunity for professional growth should also be possible for each coordinator. Both time and money should be budgeted to allow for both graduate level academic course work and in-service training in terms of workshops and other opportunities for growth in an effort to become better able to meet the learner's educational goals.

Counseling

To many who enter the learning laboratory, this is an opportunity for a new approach to learning. The flexibility of the learning laboratory presents an opportunity for education that will allow for learning under conditions unlike the typical classroom found in most schools today. The conditions that resulted in the learner's termination of his formal education may be reflected in his behavior when he enters the new learning laboratory situation. The understanding and counsel that a coordinator can demonstrate is very important to the educational progress that each learner may make in this new learning venture.

Counseling, or advising, is one of the responsibilities a counselor will assume. Preparations for counseling can range from an understanding of people to formal professional-level work in the guidance and counseling of adults. The coordinator should recognize, however, that he cannot be all things to all people. Professionally trained counselors are available from both public and private agencies to assist or to serve as referral agents when the need exists. As a coordinator, the recognition of one's own limitations in counseling and assistance is needed. Outside help from employment counselors, ministers, psychologists, and psychiatrists is generally available and should be called upon. Knowledge of the available services and assistance is one of the most important resources at the disposal of the coordinator. However, the coordinator will be required to perform some counseling activities and should be prepared to help learners in the following areas.

Vocational-Occupational Counseling. Most new students seek out a learning laboratory with certain goals in mind. A common need is for additional education to acquire a new or better job that will improve the overall living environment. The counselor will need to be knowledgeable in the educational level requirements for various vocational and occupational opportunities that exist in the area. The local employment security office and area personnel officers may provide a useful source of information and assistance. Also, these same sources of information may become referral agencies for new students.

The coordinator has an obligation to be honest and realistic in helping the student relate his vocational-occupational goals to his ability. Counseling about his goals should be at a practical and achievable level. Creating progressive steps toward the desired goal will tell the student what he needs to do to reach his ultimate goal.

Personal Problems. Personal problems may have been the cause of the prior interruption of a student's formal education or the impetus behind the person's current desire to return to school. The coordinator is often selected by the student to listen to these problems which may range from minor sources of trouble to ones so complex that the coordinator might elect not to become involved. Simple problems such as travel, baby sitters, and work are routine; however, very complicated problems should be referred to other agencies. The limitation that a coordinator places on his capacity and ability to counsel in the area of personal problems needs to be thought out and decided upon before encountering difficult situations.

Socialization

The learning laboratory concept stresses the individualized, self-instructional approach to learning through programmed material, and the total program is designed to allow the individual to work alone in a non-competitive atmosphere. However, one of the main sources of learning and satisfaction is the interpersonal relationships that develop among learners and among learners and coordinators. Men and women cannot learn, work, or live effectively by themselves. Neither can they gain knowledge solely through the process of programmed instruction.

The coordinator may take every opportunity to bring the learners in the laboratory together for brief social affairs such as, a birthday party, Christmas party, or the celebration of a learner passing his General Educational Development Test. These opportunities will do much to create a close relationship and understanding between the various social levels and cultural groups that meet on common ground in the learning laboratory.

Each laboratory should have a lounge which has as its focal point a coffee pot, soft drink machine, snacks, and a place to eat a carry-in lunch or sandwich. A small lounge area with comfortable chairs and a pleasant atmosphere is an excellent place for students to take a break from their studies. The total environment should be such that students look forward not only to working on their lessons, but also to developing and broadening themselves by sharing with others their lives and experiences. The pleasant experiences of the learners will serve to attract new students and further meet the community's adult educational needs.

Other socialization opportunities include group sessions and field trips to attend cultural and recreational centers in the community. No opportunity should be excluded that might bring new experiences and enrichment into the lives of the learners both individually and collectively, for it is believed that once the coordinator recognizes and encourages this type of social interaction a major function of the learning laboratory objectives will have been achieved.

Beliefs and Attitudes Re-Orientation

To the careful observer the profiles of learners in learning laboratories represent a cross section of society, even though each city or state has its own unique make-up of clientele to be served. Recognition of this fact by the coordinator and an understanding of the students is an important consideration in the operation of a useful and effective learning laboratory.

A major challenge for the coordinator is to help the learner see that his present attitude toward learning can be changed and improved and that education can be practical and of value to both the individual and his immediate social environment. The cultural background of some individuals may be such that education has never been pleasant or necessary for their existence. Special efforts and examples will need to be incorporated into the thinking of the coordinator to help him show the student that self-improvement through learning can help his daily living. The coordinator can serve as a model and agent in helping the student change his beliefs toward learning.

The coordinator, as a friend and confidant, can help the student examine his own personal beliefs. Helping a student to develop a new self-concept and to acquire an attitude toward his expectations for life based on his ability to control his own destiny is important. Learning can be shown to be a vehicle to a new life and not the threatening and negative experience that has so often been the case. Learning for learning's sake must be transformed into learning for life and into new opportunities of unlimited scope.

For the coordinator, this challenge may be one of the greatest to be faced. The re-orientation of the learner is difficult to achieve and the results hard to measure in tangible terms. It is, however, definitely a very important aspect of the leadership and counseling process that is a significant part of the learning process for many of the adults seeking new knowledge through the learning laboratory.

CHAPTER 3

DESIGNING AN INSTRUCTIONAL PROGRAM

Introduction

The core of the learning laboratory is in the design of the individual instructional program. To insure that instructional programs are properly designed, the coordinator must have a working knowledge of the materials and media available for use of the pre-assessment process, and should understand the principles appropriate for effective program individualization.

Knowledge of Materials and Media

In the learning laboratory each coordinator is a curriculum resource specialist. To be qualified to introduce a learner to the concept of individualized, self-instructional learning, the coordinator must know and understand the materials and media available in regard to their intended purpose, the prerequisites necessary to use them, the relevancy they will have to the learner, and their appropriateness to the overall program. Only by having and using this knowledge can the coordinator intergrate various components into a plan that fits the learner's needs.

Purpose

As a resource person, the coordinator is responsible for selecting program materials and media that will be useful for the clientele the laboratory serves. To do so, the coordinator must be able to identify the purpose of all materials being used. Most materials are commercially produced and many come with a technical report which states in some detail the minimum general objectives of the program as well as the source and scope of the program validation.

Each unit of the program should be examined before actual incorporation into the laboratory curriculum. This examination should readily reveal behavioral objectives that the learner must be able to demonstrate upon completion of each unit. Pre-test, post-test, and unit-tests allow the learner to demonstrate the learning achieved and should provide for measurement of the degree to which the objectives were fulfilled.

The primary aim of identifying the purpose of the program through behavioral objectives, therefore, is to insure that the learner obtains the material that is best suited for his individual needs.

Prerequisites

In dealing with such an array of materials as are found in the learning laboratory, a knowledge of the prerequisites necessary to perform successfully in a program or in any given unit of a program is mandatory if students are to be provided with material that is appropriate to their needs and abilities. Therefore, the coordinator must know, for each program, what skills, concepts, and attitudes a

learner must possess in order to be placed into that program. This knowledge can only be gained by a careful reading of the manual accompanying the program and by actually working through the program. Even then, for many programs, it will be necessary to compare this knowledge with the experiences that learners have when using the program in order to verify or modify the original designation of appropriate prerequisites.

Relevance

Each learner enters a learning laboratory with certain ideas about what he expects to achieve. The coordinator should be helpful to the learner in establishing realistic objectives and goals. The planning for the learner's program should be flexible and the units of work in the individualized, self-instructional program should fit into the total program plan. The designing of the instructional program should be in keeping with the eventual goals of the learner. Effort should be made to be certain that each unit of instruction will build toward both the short-term and long-range personal educational objectives of the student. The guidance and counseling of the coordinator as a curriculum resource person should be directed toward this goal as the instructional program is outlined for each individual.

Therefore, each unit of each program must be examined to insure that the maximum benefit is derived for the learner. Units of study must be meaningful and real to the learner if he is expected to continue in his program of study. Evaluation and reinforcement helps

to support the learner in his daily work; however, if he feels his unit content is not important and relevant, he may elect not to continue. The coordinator has a responsibility to establish a program that has importance for the learner. This will require an in-depth knowledge of the content of each program.

Appropriateness

The coordinator, as the curriculum resource person, has two basic content goals to satisfy. The content of the curriculum must be related to the instructional program designed for the learner. Though the learning laboratory offering might be broad, analysis of the learner's educational needs might reflect a concentration toward a specific area of educational level. The choice of appropriate learning materials and programs should be consistent with the background of the clientele attending the learning laboratory.

The educational philosophy of the institution may establish certain boundaries and goal limitations for the program offering. The learning laboratory should examine its goals to see if they are appropriate to the institution's learner clientele and in keeping with the institution's goals. When the learner's educational needs and goals differ from the institution's, it may be necessary to review the role of the institution. Accommodating the curriculum desires and needs of the learners may require expansion of the institution's position toward a specific instructional program.

The second requirement is that appropriate content related to both instructional and institutional goals requires compatible and

usable media. The use of various forms of media contributes significantly to the facilitation of learning. The coordinator is responsible for selecting content that is adaptable to existing or expected acquisition of new equipment. Program content without compatible media is of no benefit to either the learner or the institutions. Program content purchases for the learners should be given careful thought to be sure the appropriate media are available. The learner population should find the various media helpful, useful, and easy to operate as well as appropriate to their needs, skills, and previous experiences.

Thus, it is possible to indicate, as is done in Figure 1, page 43, that a coordinator's knowledge of materials and media, as a prerequisite to instructional design, is developed through an understanding of their identifiable purposes, the prerequisites for entering them, their relevance to the intended learner, and their appropriateness to the educational program.

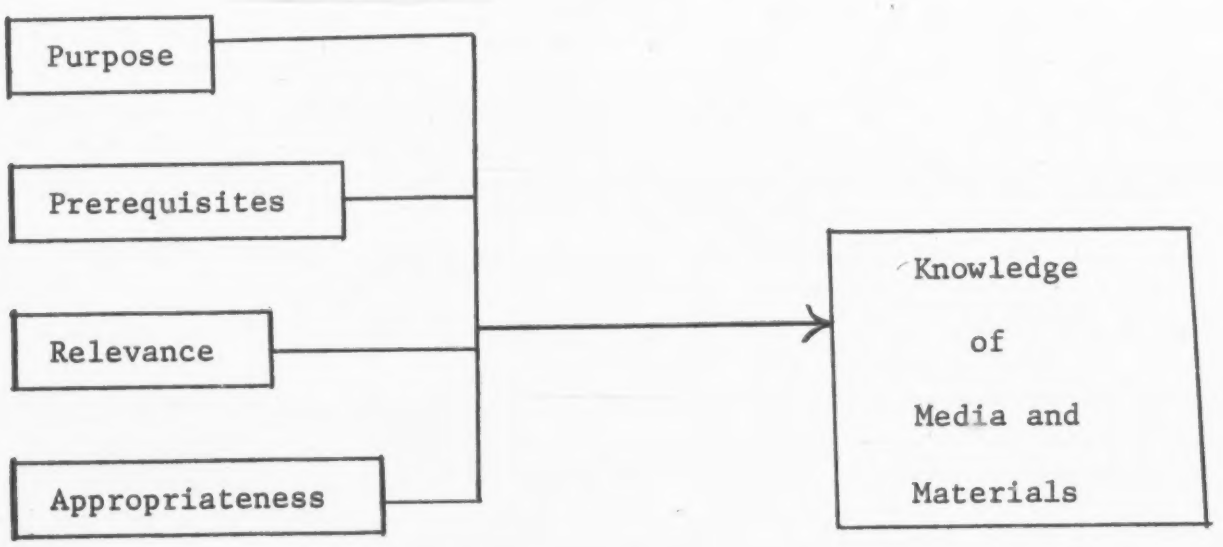


Figure 1. Coordinator's preparation

Objectives

The effectiveness of the instructional process is closely related to how clearly objectives have been defined. Objectives indicate what the instruction is to achieve and point the way to that achievement. For this reason it is advisable to have a clearly articulated hierarchy of objectives that lead from the individual program to the accomplishment of institutional goals. Such a hierarchy will minimize confusion and help to fit each program into the overall instructional design.

Institutional Objectives

Institutional objectives are usually based upon a philosophy that reflects the institution's general attitudes and beliefs about education. This philosophy may be construed as the ideas upon which the institution is founded and operates; the objectives, however, are the observable results by which the institutional activities may be measured. A community college, for example, may incorporate as part of its philosophy an "open-door" policy--providing educational opportunities to all who desire them. Its objectives, however, must depict the ways that these educational opportunities may be provided. Such a college, for example, may develop an objective to provide learners with the equivalency of a high school education. Such an objective then would lead to implementation of a program of instruction designed to prepare learners to take the General Educational Development Test. The learner's passing of the G.E.D. would be the demonstration of the institution's having achieved the objective.

The effectiveness of the institution's instruction could be measured by the number of learners who successfully complete the G.E.D. in relation to the number of students who entered this instructional program. Only by specifying such objectives can organization and direction be given to the institution's comprehensive endeavors.

Learning Laboratory Objectives

As the learning laboratory is usually a component of a larger organization, it must also have articulated objectives. These objectives need to be consistent with the general philosophy of the institution, and they should be written to point out what specific instructional services the learning laboratory is to supply to the learners. Broadly stated, typical learning laboratory objectives may be to provide instruction that prepares learners to take the G.E.D., to provide instruction in various technical or vocational programs, to provide supplementary instruction in support of other institutional programs, or to provide basic instruction for adults who want only to learn to read, write, and do simple math. Again, the more specifically these objectives are defined, the more appropriate will be the instructional designs for accomplishing them.

Program Objectives

Programs within the learning laboratory should be designed to achieve one of the laboratory's written objectives. The objectives of each program should be consistent with the lab's general objectives and with those of the institution, and they should indicate a proficiency level the learner will have achieved upon completion of the

program. The proficiency level should not be construed, however, as an objective, for it is simply the level of learning attained. Demonstration of achievement is made by completing the program objectives.

Instructional Sequence

Within each program there should be numerous instructional sequences leading to culmination at a program proficiency level. Each of these sequences should be an integral part of the program; each should have its own level of achievable objectives, more properly identified as task performances. Performing the tasks required by the sequence signal the learner's successful completion of the sequence and his readiness to proceed to the next sequence. All such instructional sequences should be selected for a learner on the basis of their appropriateness to his individual goals, his entry level behavior, and his personal preferences. An example of an instructional sequence could be a segment in English usage that presented instruction in punctuation, spelling, sentence structure, etc. Each sequence, however, should be graduated, with successful completion of one sequence meaning adequate preparation for entering the next one in the series.

Instructional Units

The instructional sequences can be broken down into units of instruction. In the example given in English preparation for the G.E.D., the instructional units would be in such areas as punctuation, spelling, and sentence structure. Each of these units should have

behavioral objectives written for them so that mastery of the unit could be demonstrated in a measurable manner as evidence that the learner had succeeded. Well-written behavioral objectives will identify the terminal behavior the learner is expected to demonstrate, the conditions under which the behavior will occur (i.e., objective test, essays, etc.) and the criteria for acceptable performance (number of items correct, percentages required, etc.).

In summary, there are distinct advantages for both the learner and the instructor in having a hierarchy of objectives written in detail. First, the learner can see clearly what behaviors he must be able to demonstrate for successful completion of the program. In addition, he can evaluate his own progress toward that successful completion by the intermediate objectives for units and instructional sequences. For the coordinator, objectives serve to identify problems encountered by learners at various stages, providing the opportunity for revisions of programs to correct those problems. Since each learner's progress in every unit toward every objective is measurable, it is possible to evaluate learner progress as well as instructional and program effectiveness. One last advantage is that objectives serve to unify and direct the overall organization and planning of an instructional component in relation to other organizational objectives and goals. This integration of a hierarchy of objectives is depicted schematically in Figure 2, page 48.

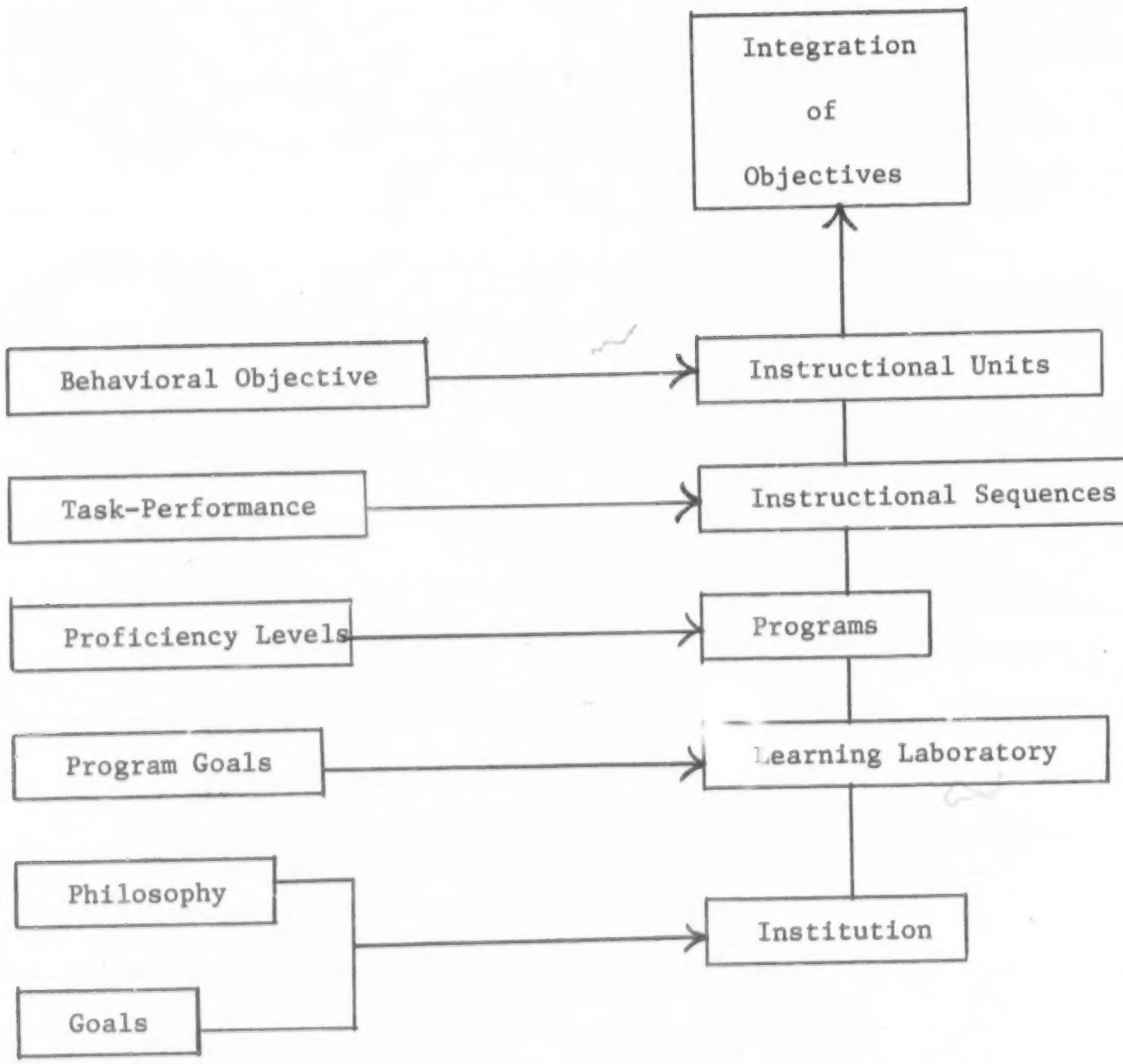


Figure 2. Hierarchy of objectives

Pre-Assessment

The adult learning laboratory concept is established on the philosophy of the "open-door policy"; therefore, the students entering the laboratory will reflect a cross section of society in age, race, culture, and education. The coordinator that views his position as one of confidant, facilitator of learning, and counselor will be the one that provides the best opportunity for learning.

Success in introducing learners to the learning laboratory situation will depend entirely on how well the coordinator is prepared. A positive attitude, a knowledge of the concepts of programmed instruction, an understanding of the material and media, and a desire to help adults must be fused together. Prior preparation and confidence will enable the coordinator to assist any learner who enters the laboratory seeking help. The coordinator is obligated to be thoroughly familiar with the job and to demonstrate this by readiness to meet the learner more than half way. This understanding will set the atmosphere for the learner's first contact with the laboratory personnel.

Interview

The coordinator as the curriculum resource person is responsible for conducting the initial interview upon the learner's arrival at the laboratory. Finding a friendly and business-like atmosphere should be the learner's first contact with a totally new learning experience.

The first interview is usually held in the coordinator's office as this provides a place for a conversation that allows the student to express his needs and goals in confidence and also does not disturb other students. The purpose of the first interview is to allow the learner and the coordinator to exchange necessary information prior to the establishment of the individualized instructional program.

The coordinator, in the initial interview, should request certain biographical information for the laboratory records. Questions will be asked and discussed concerning address, age, employment, family, etc. The coordinator may also use this time to tell the prospective student certain things about the learning laboratory and those who use its facilities. This is an important phase of the continuous orientation each learner receives to the learning laboratory and the concept of individualized self-instruction.

The interview will center around determining what the learner's individual educational goals are. This gives the learner a chance to express himself and to rethink his purpose in coming to the laboratory. The coordinator is responsible for aiding the learner in the expression of his individual educational goals and in assessing his chances for attainment of these goals. Prior educational experiences should be assessed and discussed to help establish the gap between where the student is and where he wants to be.

The first interview also allows the coordinator to determine if the prospective student has any physical disabilities. Often the disabilities that required a student to leave the regular school program may not be a limitation in the learning laboratory. Important

to the coordinator is the recognition of any limitation so that it can be determined if the person can be helped.

Testing

Care should be used by the coordinator in introducing the subject of testing to a prospective student. The need and purpose of testing as it is related to helping the student should be introduced in the first interview. It should be explained clearly that the student is not being placed in a competitive situation where he will be ranked or compared with other students. A student's test results, like the learning situation, are non-competitive. Testing should be explained and justified so that it does not threaten or create anxiety in the student.

The confidence of the student relative to testing is critical, as each unit or program that is offered in the learning laboratory curriculum incorporates pre-test, unit-test, and post-test as a measure of the learner's achievement. Testing in the context of the learning laboratory will become second nature to the student if properly introduced and understood.

Placement. Tests that are designed to determine a learner's present level of achievement are important. The tests usually reveal this type of information by equating a person's level in several subjects such as English, mathematics, and reading with other areas. The level of proficiency will vary within each of these areas; therefore, they may require a different prescription in designing the courses of instruction for the learner's own individualized,

instructional program. (See part C under Counseling in the next section).

Aptitude. Tests of aptitude are generally found in learning laboratories; however, their use is not as broad as the proficiency tests. In adult education it is believed that every student can learn any subject at his own rate. Aptitude tests help coordinators determine the readiness and cognitive skills that the learner possesses.

Interest. Learners who come to a laboratory seeking help usually have some particular goal in mind. The coordinator, through the use of interest and aptitude tests, can help the student explore new possibilities and make better judgments about existing interests from information determined through testing. Interest tests are designed to help the student look closely at himself and other opportunities that might be open to him. The coordinator is responsible for helping make the learner's interests realistic and clear in relation to his level of proficiency and goals in education.

The use of tests and testing is an important phase of the pre-assessment of the individual learner. The coordinator is responsible for the proper administration, interpretation, and security of tests. The learning laboratory has a special need for providing the proper testing conditions for maximum student achievement. A room that is properly designed and equipped to provide the best testing conditions is important to both the student and the learning laboratory.

Counseling

The learning laboratory coordinator has many roles that require being a professional, a confidant, and a friend. The role of counselor is a duty that requires patience and understanding while being realistic and honest with the student.

In the counseling or advisory phase of the pre-assessment of the student, the coordinator must draw together a comprehensive picture of the learner. The fusion of certain facts, observations, and impressions about the learner forms a basis for an individualized, instructional program. The center of attention is on the learner and how he may be assisted to take a realistic look at the situation. Both the student and the coordinator, in a counseling situation, must look at the alternatives available for the program of study. The student, aided and assisted by the coordinator, must consider the alternatives and make a decision about his program of instruction. This is a difficult time for the learner, but with proper assessment, guidance, and counseling from the coordinator, the decisions may be made with confidence.

No decision regarding the student during or as a result of the pre-assessment process is final. New information and understanding as viewed through the concept of individualized, self-instructional learning allows for immediate re-evaluation and change in the program of study as needed.

The final phase of the total pre-assessment process is the actual scheduling and placement of the learner. Each course of study is designed to fit the learner's individual needs and his educational

program of study. Placement in each course should be done by the coordinator. The instructions on the use of the programmed material, references, and media will require a careful explanation. Practice frames should be used to be sure that the student understands the directions and is able to proceed on his own. Each course is introduced in a like manner. However, it is advisable to begin only one new course with each visit to the laboratory. This allows the student an opportunity to become familiar with and experienced in one course before entering another new course.

Following placement in each course, the coordinator should check on the learner's progress to be sure he understands what activities are required of him. Interest and close personal contact by the coordinator serve to reduce anxiety and reinforce the learner's self-concept, thus making learning a positive experience.

Regular attendance is suggested so that measurable progress toward the accomplishment of the individual's personal educational goals can be realized. However, learners should be encouraged to study at any time they feel they have the opportunity. The flexible operation of the learning laboratory and the concept of individual learning allows the maximum opportunity for the student to participate at his convenience.

Learners who fail to attend regularly should receive friendly counseling as a follow-up process. The coordinator may wish to call or write, letting the learner know he has been missed or to see if there are circumstances which might have prompted his leaving that could be corrected or changed.

Summary

The importance of the proper introduction of a learner to the laboratory and of the pre-assessment process cannot be emphasized enough. The initial impression the learner develops upon his first contact with both the laboratory and the coordinator may well influence his perception of the overall value of learning to him. Success in the pre-assessment phase will depend on how well the coordinator relates as a person and the feeling that the learner has toward this opportunity to help himself. The total pre-assessment process is schematically represented in Figure 3, page 56.

Instructional Design

The problem of appropriate instructional design becomes a major concern for the coordinator in a learning laboratory as the wide variety of backgrounds, previous educational experiences, and educational objectives of the adult learner are considered. However, by following a selected sequence of activities the problem may be simplified and more effective instruction can result.

Programs

Define the Program. The first step in designing a learner's individualized instructional package is to define the program based upon the learner's identified educational goals. In this way it is possible to be sure that all instruction to be provided will be pertinent and, thus, should make the learning process more meaningful to the learner. For instance, if a learner's goal is to secure the

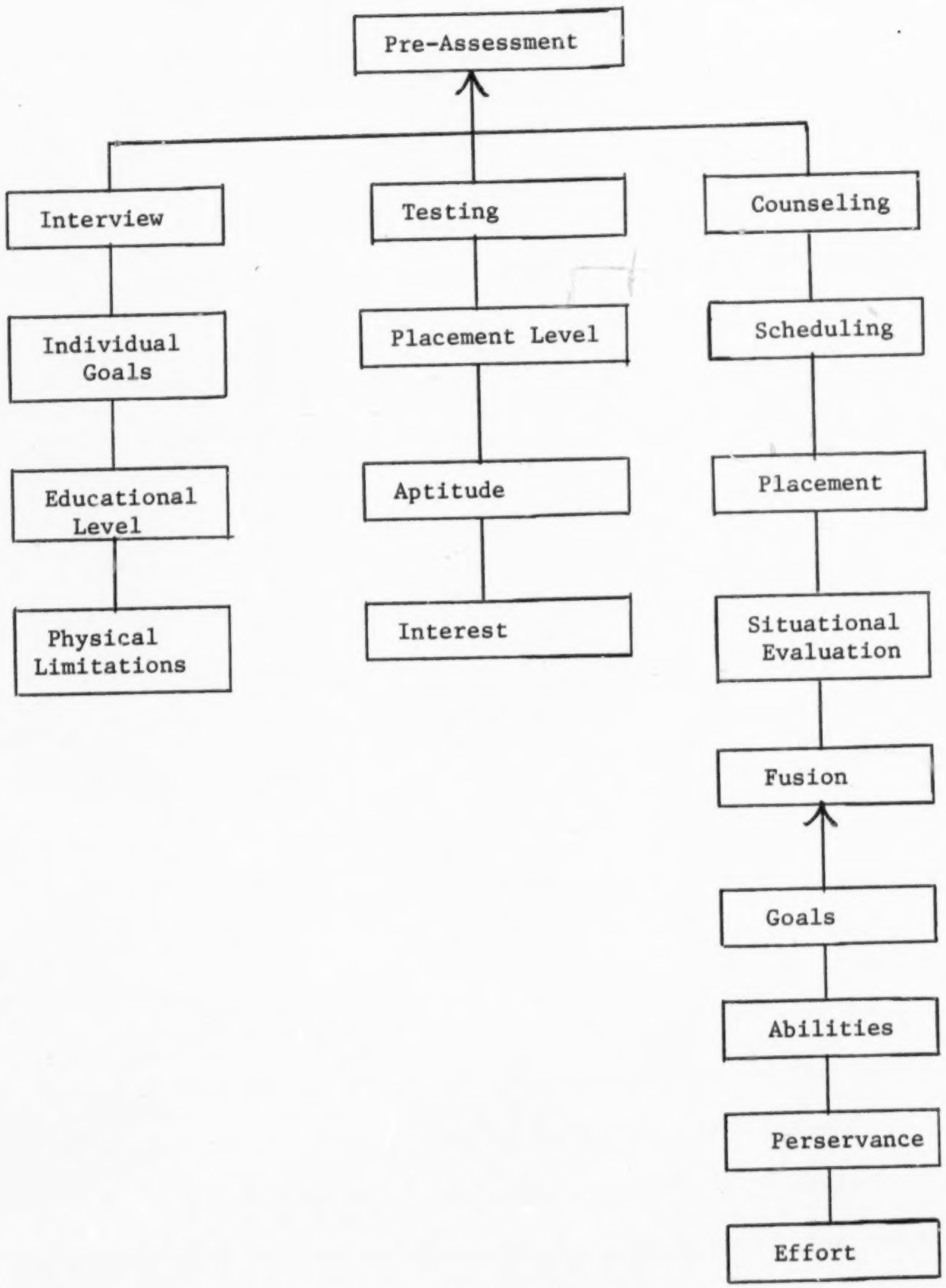


Figure 3. Pre-assessment process

equivalent of a high school diploma then his program will be comprised of instruction that will allow him to achieve that goal. While instruction in American history may be necessary for him to achieve that goal, instruction in current European history may well be beyond the scope of the objectives that must be achieved in order to pass the G.E.D. Each program then, should be considered separately and restricted only to those instructional sequences that are relevant to known objectives.

Select Response. After the program has been defined, the proper sequence or sequences of instruction that will make up the total program may be selected. Each sequence should serve to lead the learner toward completion of the behavioral objectives specified both for the sequence and for the program. In organizing instructional sequences, consideration should be given to their continuity, progression, and integration. For example, an instructional sequence in mathematics should have continuity in that each unit contains repetition of work on an emphasized area. In addition, each unit should be progressive in that it builds on the concepts worked with in previous units. Finally, the sequence should provide an integrated quality in that all of the concepts used in the instruction relate in such a manner as to allow the learner to assimilate them as a whole rather than as distinct and separate parts. The extent to which the learner can integrate his learning into his behavior will depend upon the degree to which he can see the totality and meaningfulness of the concepts with which he is working. Therefore, an instructional sequence in mathematics that contains work with

fractions should provide work with fractions in each unit as a matter of continuity; it should be progressive in that it builds from the simple to the complex computation of fractions, and it should culminate with the practical application of the use of the concept of fractions, not merely with a series of problems of different levels of difficulty.

Entry-Level Behavior. In addition to properly defining the program and selecting instructional sequences appropriate to the program, the coordinator must also establish the learner's entry-level behavior. Entry-level behavior refers to the capabilities that the learner possesses which will enable him to successfully begin work at a given level. For instance, if the learner has had no previous experience with fractions, it will be necessary to start his instruction with a unit that introduces the concept of fractions rather than one which would require him to immediately do computations. On the other hand, if it is possible to identify a demonstrable understanding of the concept of fractions on the part of the learner, he may be placed at a level commensurate with that understanding. For effective instructional design, it is imperative that entry-level behavior for all instructional sequences be identified as closely as possible with the learner's actual capabilities. Also, this identification must be made separately for each type of instructional sequence since a learner's entry-level in mathematics may be drastically different from his entry-level in English or science.

Learning Experiences

After the program has been properly defined, sequences selected, and entry-levels established, the next step is the actual design of the learning experiences. Learning experiences are the activities in which the learner will engage during the instructional process. They will involve his interaction with the instructional materials selected and will vary according to the type of media selected for delivery of the content.

To return to the mathematical example, it may be determined that a learning experience with changing money is required by the learner's program objectives. Activities might include reading about money and how to make change, being shown representations of both currency and coins, or actually handling real currency and coins. Materials to be used in the experience could be a traditional textbook that explains the concept of making change, a programmed lesson on making change, or real currency and coins. The media by which these materials are presented could be a programmed textbook, a filmstrip, a tape recording, or the coordinator. The design of successful learning experiences requires that the activity be supported by the proper materials presented through the appropriate media.

Principles of Instructional Design

There are four cardinal principles to be observed in designing an individualized learning package. These are (1) involve the learner, (2) provide for immediate success, (3) provide for practice, and (4) provide for positive reinforcement.

Learner Involvement. The more the learner is involved in the design of his program, the more meaningful it is likely to be to him. Therefore, he should have an opportunity to discuss and help set his own overall objectives; he should be instrumental in establishing a time schedule that is both realistic and suitable to his personal needs. Also, optional materials should be available in order to allow him to choose those that he feels will be most interesting to him. Finally, a learner should be allowed to indicate his preference or dislike for any particular types of media.

Immediate Success. The second principle is that of providing the opportunity for initial success. No learner should ever be placed in an initial learning experience that will result in fear, frustration, or failure. If he fails on his first attempt, he will probably be discouraged and will begin to develop a "set" for failure; however, if he succeeds, he will likely feel satisfaction and find some confidence in his ability to achieve his goals.

Practice. Making provision for adequate practice in the skill or concept being learned is the third principle for effective instructional design. The more successful repetitions the learner has, the more chance there will be of his being able to utilize what he has learned. So, the more practice the better, but only if it is meaningful practice that is well planned and properly spaced throughout the sequence. Having too many practices in one unit or one time period will be more likely to produce boredom and inattention than effective learning.

Reinforcement. Finally, the instructional package should provide for positive reinforcement of what the learner has accomplished. Such reinforcement may be in the form of verification that an answer is correct, a congratulatory comment at the end of a taped lesson, or a hearty and sincere "Well done!" from the coordinator. The form of the reinforcement is not as important as is its presence; for whatever the form, it will serve to make the instructional process more important, enjoyable, and worthwhile to the learner.

The Instructional Design Process

The steps in designing the instructional program discussed in this chapter may be summarized in a schematic representation (Figure 4) of the overall process. Utilization of this process in developing individualized instructional packages is deemed a major factor in making learning laboratory instruction more effective for each individual learner.

Summary

The concepts relevant to designing an effective instructional program for the learning laboratory are depicted in Figure 5, page 63. An understanding of the purpose of these concepts and of their proper application will aid the coordinator in developing a more systematic approach to the instructional process.

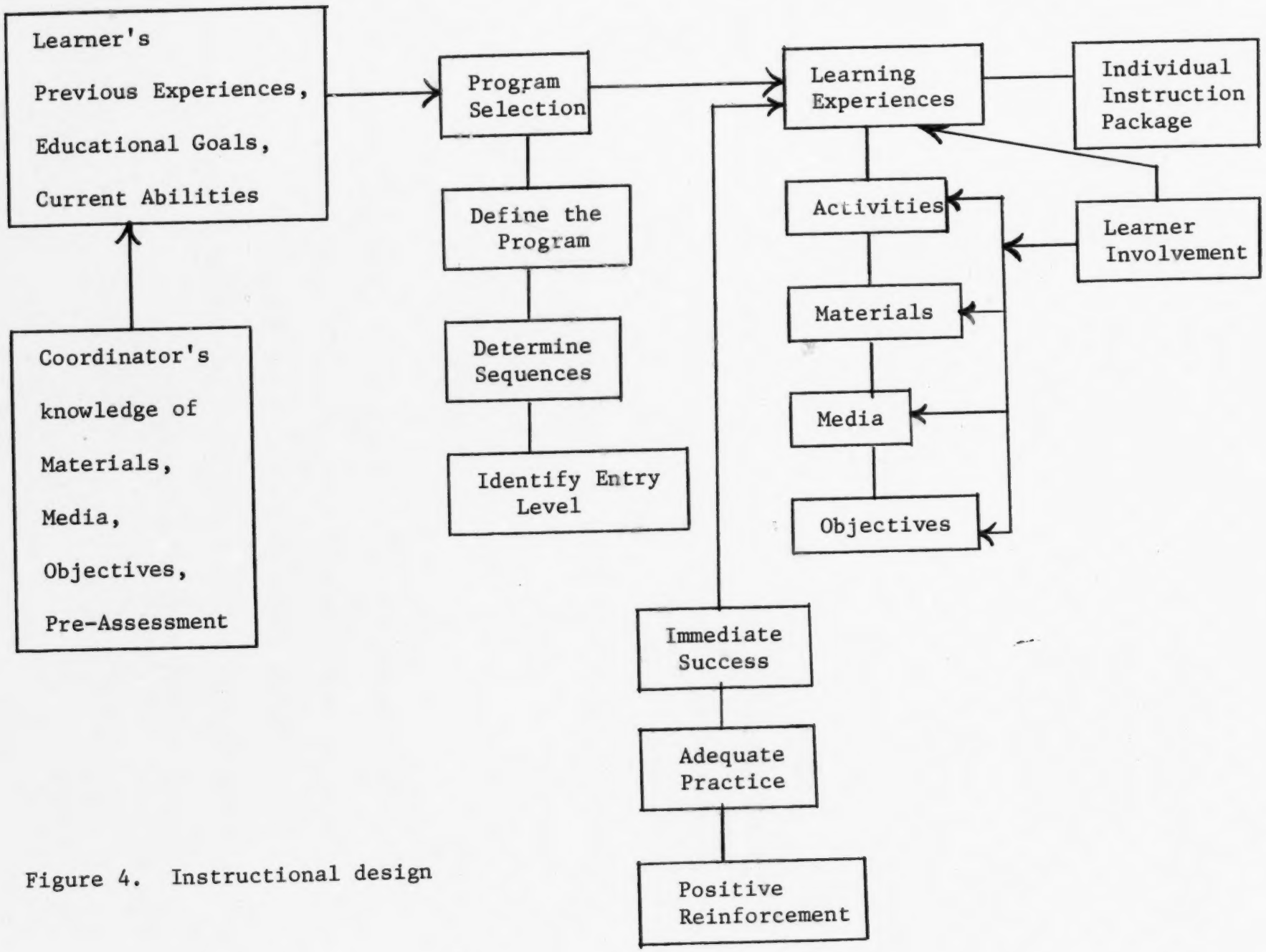


Figure 4. Instructional design

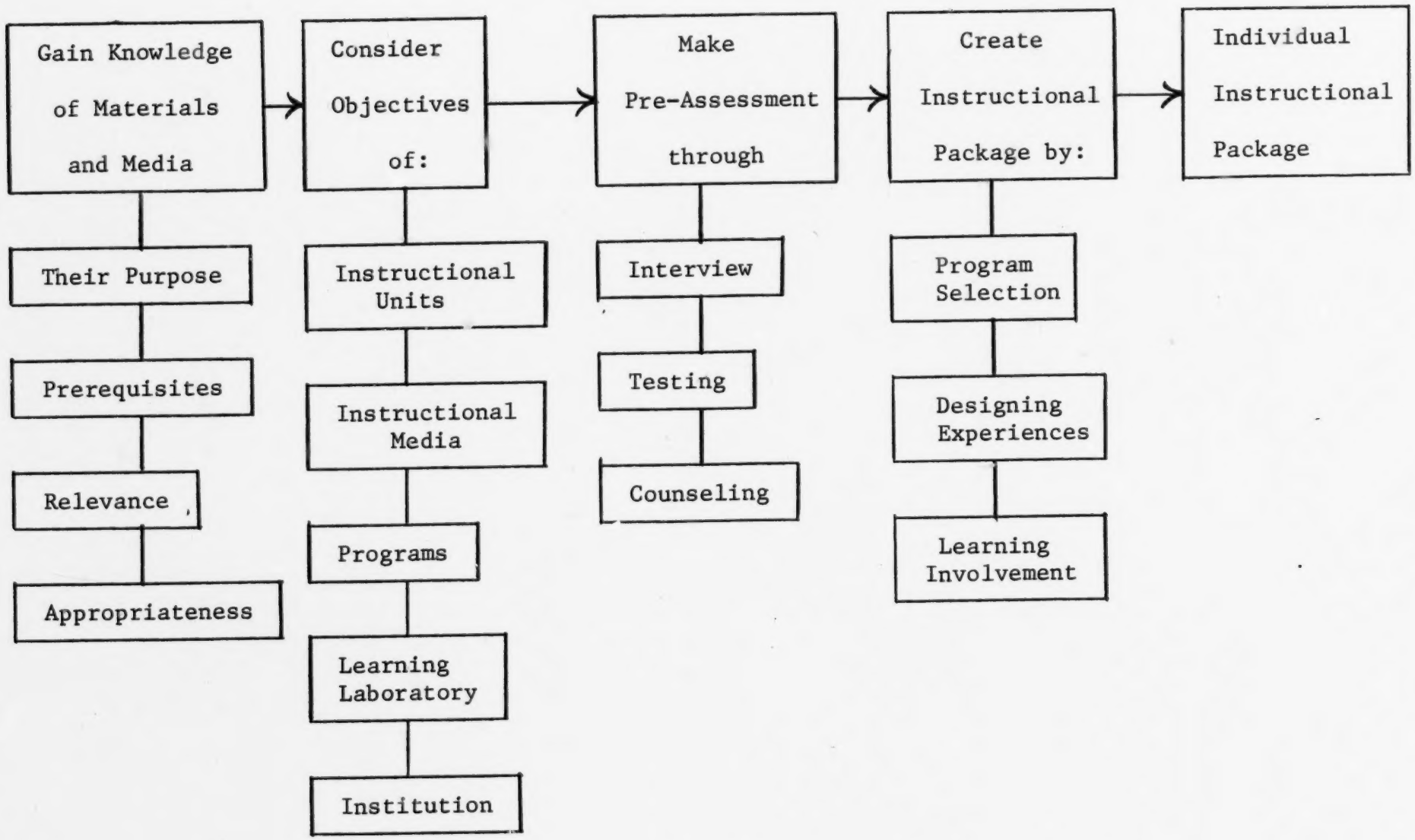


Figure 5. Designing an instructional program

CHAPTER 4

EVALUATING PROGRAMMED MATERIALS

Introduction

When using programmed instruction, the burden of instructional effectiveness is on the program. In recent years there have been a large number of programs, produced on a wide array of subjects and from a variety of sources, for various levels of instruction. Also, not all programs available for learning laboratories have been of acceptable quality.

The authors have interviewed numerous learning laboratory coordinators, and a common complaint from nearly every coordinator interviewed was that there is a lack of appropriate material for adult learners. Early producers of instructional programs frequently converted elementary and secondary level programs to a programmed instructional format without concern with appropriateness for adults.

The purpose of the foregoing background is to establish a basis for the need of having valid and proven research studies to support the instructional programs now on the market. Coordinators should receive information attesting to the basic characteristics, background, and validation of the program. The coordinator is encouraged to look carefully at the validation included with each existing program and each proposed instructional program.

A Method of Evaluation

The coordinator needs to develop a method of evaluating materials so that the best selection for the purpose may be made with a basis upon the anticipated effectiveness and the costs. Although there can be no guarantee that any evaluation will always be correct, it is possible to improve one's chances of choosing the most functional programs. For this reason, a method of making such an evaluation is presented here as an aid in the selection of materials.

Purpose of the Materials

The evaluation procedure begins with an identification by the coordinator of the purpose for which the materials are to be used. That is, the coordinator must be able to relate the materials to the objectives developed for a specific unit, sequence, or program of instruction. It also requires a knowledge of the ability levels and cultural characteristics of the learner population. Once the purpose--based upon the objectives and the learner population--has been identified, then a review of the instructional materials available to meet this purpose is in order. Such a review should be conducted in a systematic manner; and it is strongly recommended that a standardized worksheet, such as the one included in Appendix A, be utilized for all materials reviewed.

The Technical Report

The actual review of the materials should begin with a reading of the technical report accompanying the program. This report should identify the objectives of the instructional component, the learner

population for which the instruction was designed, its assessment capabilities, and recommendations for its usage. The following is a proposed set of guidelines for the new or inexperienced coordinator to use in interpreting the technical reports or other documents that explain the instructional effectiveness of a program.

Often this report will be a separate publication; however, it may be incorporated into the teacher's manual, promotional material, or other similar document related to the program. The term "technical report" is used throughout this publication since it is in keeping with the Recommendations for Reporting the Effectiveness of Programmed Materials prepared by the Joint Committee on Programmed Instruction and Teaching Machines of the American Educational Research Association, the American Psychological Association, and Department of Audio-Visual Instruction - National Education Association (See Appendix A for complete recommendations). A technical report in this context is a publication that is the result of a research study on the effectiveness of an instructional program made under specific and controlled conditions. The report should indicate the amount of measurable gain by learners based upon the difference between where they started and where they were at the completion of the program of instruction. In other words, it should answer the question: Did the program accomplish what it was expected to accomplish under the conditions and limitations of the research study?

Contents of the Technical Report. The actual contents of the technical report need not be long or obscured by lengthy statistical

tables and analyses. What is important is that the report clearly answers questions pertaining to the validation and usefulness of the program. Every report should contain at least the information outlined in the following areas.

Learner Population. A description of the learner population and the number of persons used in the research study is important. The method of selection of the participants, their general group, related age, educational level, and cultural background is necessary. This information may then be related to the background of the intended population, their characteristics, and the laboratory situation.

Assessment. The technical report should include both the program and unit design for measuring its objectives. The pre-test and post-test designs are usually based on specific behavioral objectives. Evidence of a statement of the reliability of each instrument used is highly desirable. If several populations were studied, the data for each group may be included. Specific rates of learning for the various populations should be given both in terms of real score gain and percentage increase.

Objectives. The program of instruction should state clearly the broad objectives. These broad objectives must be supported by specific behavioral objectives for the program and for each unit in the program. The behavioral change expected of the learner should be specifically stated, described, and defined. This statement about the learner's behavioral objectives should be in unambiguous terms delineating the conditions of performance and levels of proficiency

to be obtained. (A brief review of Chapter 2 concerning behavioral objectives may prove useful at this point.)

Field Testing. The conditions of field testing should detail the experimental conditions used in the study. A statement concerning the number of learners that started and finished each program, as well as the assessment data, is important. The location of the testing area, the time allowed for completing the program, range of achievement levels, and general learning conditions should be stipulated. The report should reveal any extrinsic motivation, such as a class requirement, financial reward, or other source, used to increase the test groups' willingness to participate in the field study.

The foregoing items are deemed minimum requirements for a useful technical report on programmed instructional materials. These reports are the most effective and efficient method of evaluating programmed materials; however, if no technical report is available--and many are not at present--then other criteria may be developed for evaluation of programs.

Evaluative Criteria

The following list, though not exhaustive, could serve as a general guide for developing an effective method for the evaluation of materials.

Instructional Manual

Almost all programmed materials have an instructor's manual available for use by the coordinator and many have additional manuals

for use by the learners. These manuals generally outline the objectives of the materials, contain explanations of how to use the program, and provide directions for the administering and grading of tests. As a criterion for evaluation of the materials, the manuals may indicate the ability level required for using the program, the complexity of the instructional procedures, and the variety of testing measures used in the program.

Test Design

A second criterion for evaluating programmed instruction materials is the design of the testing measures. A programmed instruction unit should include a pre-test based upon the behavioral objectives of the instructional materials. This test should provide not only an evaluation of the amount of knowledge already held about the content of the program, but should provide also an evaluation of whether or not the learner has the prerequisite skills for taking the instruction.

There should also be unit-tests so that the learner will have frequent evaluation of his progress. The type of questions used should be consistent with the instructional method found in the content as well as consistent with instructional format. If multiple choice answers are found in the instruction, then it is proper for the test to also contain multiple choice answers, but it is inconsistent for the test in this case to require the learner to write out an answer rather than select an answer.

The post-test is a method of measuring how successfully the learner has achieved the objectives of the instructional material.

Thus, all questions must be criteria referenced; that is, they must be based upon the program's stated objectives. The test should contain at least four questions relevant to each objective so that it will be possible to identify specifically where performance deficiencies lie. Also, the minimum level of acceptable performance, whether 80 percent, 85 percent, or 90 percent, should be specified.

Content

The content of the programmed instructional materials may also be used as an evaluative criterion. The coordinator can, for example, judge the content on the basis of its appropriateness and relevance to the learner population. Does the content, for instance, utilize examples or illustrations that are indicative of the cultural background of the learners? Is the approach to the material one appropriate for adults or is it based upon instructional techniques for children?

Student Evaluation

Another evaluative criteria may be that done by students. In reviewing a program, it is often possible to have learners actually work through a unit, or even a total program, and then make criticism about the program in relation to its clarity, meaningfulness, usefulness, effectiveness, and relevancy.

Colleagues' Evaluation

Evaluation of materials may be enhanced by getting the experience of colleagues who have used the program in question or who are also

presently reviewing the program. Other coordinators' experiences are at least an indication of how effective the program is if they are working with the same type of learner population. Also, outside opinions are valuable as ways of finding weak areas that may have been overlooked, or at times are valuable in having one's own evaluation reinforced positively. In soliciting such opinions, however, it is urged that an attempt be made to get objective evaluations insofar as such is possible. Do not ask questions about likes and dislikes, but about measurable effectiveness. Work up a list of questions such as:

Will the learner use the materials?

Do the learners perform at an acceptable level with the material?

Do the learners find it relevant and meaningful?

Is the material practical for the learners to use?

External Agencies

Other sources of information that may be helpful in the evaluation of materials are reports that may be obtained from agencies external to the learning laboratory. The State Department of Instruction, for example, generally gathers up-to-date information on current materials being published. Reviews of programs are frequently published in the pertinent professional journals. Also, research reports involving such materials may frequently be found.

Following a careful study of the program, tests, technical report, and student and teacher's manuals, the coordinator may wish to ask such questions as:

- Are the program, behavioral objectives, and other information appropriate to the learner's needs and the learning laboratory's objectives?
- Does the program being considered fulfull the purposes for which it is being sought?
- Is the program practical both in terms of cost and use for the laboratory and its learners?
- Is the program compatible with the sequence of other subject area programs and the media available?

By following this, or a similar, established procedure for reviewing programmed instructional materials, coordinators will be better able to base decisions for purchasing materials on a more objective and functional basis. As experience is gained in using the chosen evaluation procedure, a number of criteria may be added or deleted according to the individual situation. Of course, the "home-made" yardstick evaluation is not as effective as a published technical report on the material; however, the lack of such reports for many programs demands that the coordinator design some reasonable method of his own in selecting materials.

CHAPTER 5

THE SELECTION AND USE OF AUDIO-VISUAL EQUIPMENT

Introduction

In the previous four chapters emphasis has been placed on the student and his right to learn and develop through individualized, self-paced instruction using programmed materials. The individual's learning processes and the achievement of his behavioral objectives can be enhanced through the use of various media to support the

content. One of the more distinctive features of the learning laboratory is the media that may be incorporated into an individualized instructional system. This chapter will examine the alternatives available in designing learning experiences that match the learner, content, and medium for maximum effectiveness.

The media available extends beyond the use of the traditional textbooks, maps, and films. The new concept of audio-visuals as media utilized in individualized instruction falls into four general areas: printed materials, graphic arts, audio materials, and audio-visual materials.

The proper selection of appropriate media involves the coordinator, learner, and the content area to be studied. This chapter will offer certain basic principles to guide the coordinator in the selection, use, and practical value of the audio-visual equipment phase of individualized instruction as it may be utilized in the learning laboratory situation.

Media Classification

Media available for use with learners fall into four general groups with several types under each classification. The media below do not include all of the possibilities that might exist; a creative and innovative coordinator may use or develop other types of media that may be just as effective.

Printed Materials

Programmed instruction texts produced by commercial publishers are found most frequently in a comprehensive learning laboratory as

the basis for individualized self-study learning. These texts can be found for a variety of subjects at practically all levels. Books used as references, supplementary reading, and as primary instructional sources are generally necessary. A goal of the learning laboratory should be to enable the learner to use effectively the traditional book form. The use of books and the library are important aspects of the learner's experience and introduction to continuous life-long learning.

- Teaching machines are usually simple mechanical devices that help the student work at his own pace. The instructional materials allow for practice, for work to be repeated, and for success to be experienced by each learner who uses the machine and the appropriate program. Teaching machines are used with a variety of subjects. Often adult learners are very interested in new experiences that teaching machines offer. The various forms of teaching machines when properly introduced and used generally will not pose a threat to the adult learner.

Graphic Arts

- Slides have become an increasingly popular media in the graphic arts due to their low cost and flexibility. 35 mm slides can be made by the coordinator or purchased commercially. Slide projectors are easy for the learner to operate and relatively inexpensive to purchase. Slides can be shown without audio or paired

with a coordinator-prepared tape-recording for the full benefits of an audio-visual presentation.

- Pictures are very useful as support material for the instructional program as well as for decorative purposes. Special holidays, historical dates, and other national events provide excellent opportunities for use.
- Charts are useful for the learner to have available both in a carrel or on the wall to illustrate mathematical tables, measurement, the alphabet, etc. Maps and posters are also useful for individual learners and in group study.
- Film strips are more difficult to make but the choice of commercial film strips is broad. Film strip projectors can be operated by the learner at his own pace. An advantage of film strips is that they do not require special lighting nor will their use bother other learners. The light-weight projectors can be moved easily and film strips can be viewed by either individuals or groups. Some projectors have a self-contained screen; others use a screen or a white wall. The self-contained projectors have an additional value since they may be used at a learner's carrel.
- Video tapes, like film strips, are excellent sources either as supplemental or primary instructional material; however, the tapes are more expensive to

purchase or to make due to the equipment required. Video tapes appear on a screen similar to a television set and, therefore, are more awkward to move about. The video tape can be used by individuals, groups, or classes. Often the parent organization will have the necessary equipment and technicians to create video tapes and the learning laboratory personnel can then take advantage of the tapes as a part of the integrated instructional program.

Audio Materials

- The use of tapes has received wide use in all phases of the learning laboratory instructional program. Tapes are inexpensive, can be changed with relative ease and can be made in the laboratory by the coordinators. Tapes have been used to give instructions for standardized tests, to welcome and orient the new student, and to present recorded instructional material such as speeches and poems; they provide unlimited opportunities to supplement the instructional program. Tapes are not difficult for the student to use, and they may be stopped, reversed, and listened to over and over again for practice. The use of tapes is limited only by the imagination of the coordinator and staff. Laboratory developed

tapes are also useful for staff training and for recording conferences, meetings, and other events of interest to each coordinator.

- The recorders used in a laboratory enable tapes to be made and then played on the same machine. The recorders should be compatible so that tapes made on one recorder can be played at the same speed on another machine. Several recorders allow for a number of student-centered activities to be going on simultaneously. A central tape console with dial access to each carrel is convenient but is an expensive purchase in the early development of a new laboratory. Most recorders today are trouble free and learners properly instructed can usually operate them with ease. Recorders are indispensable to the concept of individualized instruction, and full utilization of these machines is encouraged.
- The radio is a valuable tool for supplementing instruction and for entertainment. Having both FM and AM bands allows for a full range of support for the integrated instructional program by drawing upon local, regional, national, and international news and cultural events as a method of developing listening skills and analytic ability. The use of the radio may not have been fully appreciated or explored for its value as

an aid to learning, but it should be viewed as a valuable contribution to an instructional system.

- Records bring to the laboratory an unusual number of opportunities for incorporation in the instructional program. Records have been made that may be useful in music appreciation, language study, readings in literature, and instruction in certain facets of academic programs. Records are popular and plentiful; however, tapes are rapidly replacing many of the commercial educational packages that formerly used long-playing records and a careful evaluation of this contribution to the instructional program is suggested before purchase.
- Cassettes are a relatively new type of tape cartridge that allow for greater ease in use, storage, and recording. Small, portable, cassette tape players are replacing, in many cases, the larger, reel-to-reel type recording machines for various purposes. Small cassette tape players, for instance, may be used in a carrel with earphones where a larger machine would not be as adaptable. The small players either may be battery operated or use conventional electrical sources. Some laboratories have had success in loaning both cassette tapes and players to students overnight or over the weekend; however, loaning equipment for instructional and listening purposes requires thought

and planning by the coordinator if loss and breakage are to be minimized.

Audio-Visual Materials

- Sound motion pictures are available from a number of loan agencies such as the public library, universities, department of education, and state and federal governments. Motion pictures are available concerning a vast number of subjects that may fit directly or indirectly into the instructional program. Films about health, travel, and hobbies are also available for enrichment and entertainment. Motion pictures may be justified for an individual learner but usually they are more desirable for groups or classes. Often films of primary interest to one learner will be welcomed and viewed by many when it is shown in the laboratory. Educational films are not expensive to use, and many may be obtained for short-term use, without charge except for postage.

In summary, the opportunities for new experiences using the various types of media are unlimited. Care and planning should precede purchases to be sure that each acquisition is appropriate, practical, and useful for maximum learner utilization.

Principles of Usage

The result of effective instructional design should be the creation of an integrated learning system that provides instruction

to meet the learner's educational goals through the application of various media to appropriate materials. The problem of deciding which medium will be most effective for a specific learning activity is simplified when the instruction is a commercially prepared "package" that contains all components of the instructional sequence. However, it is seldom, if ever, that any learner's educational goals can be accomplished entirely through the use of pre-prepared packages. More often, the coordinator is required to construct a learner's program from a variety of instructional materials that will require a judicious selection of media. In selecting the appropriate medium the coordinator should be concerned with how the medium relates to the learner, the content, the behavioral objectives and the situation.

The Learner

One of the basic assumptions of the learning laboratory is that every learner can learn. This does not, however, mean that every learner can learn in the same way or under the same conditions. Individuals are different and individualizing instruction requires that these differences must be recognized and accommodated. In matching media to the learner, consideration should be given to personal preferences, physical restrictions, and ability to utilize the equipment involved.

The Content

Any selection of a medium requires a recognition of the content to be presented and how that content will be affected by the medium.

Instructional activities in mathematics, for example, may require various media, depending upon the specific content for a learning activity. For a lesson in counting money, an audio medium, such as a tape, may be most appropriate; while a lesson in solving problems with fractions might best be presented in print. Attention to the content rather than just to the discipline will make media selection easier and more appropriate.

Behavioral Objectives

Behavioral objectives also serve as a useful guide in determining which medium will be most appropriate to use. An objective requiring improved reading speed dictates that audio media be eliminated, and it may imply the need to use a pacing machine or filmstrip rather than a textbook or other visual medium. Always consider carefully what performances the objectives require the learner to demonstrate, and then select the media as a method of helping the learner master those performances.

The Situation

A medium is necessary for the presentation of any instruction. In many instances the situation will dictate the most appropriate medium to be used. Presenting a history unit to a group, for example, may justify the use of a 16 mm motion picture, but presenting the same unit to one or two learners makes more appropriate the use of a text or a combination of tape and slides or filmstrips. The instructional situation should always be considered as a major determinant in the selection of media.

In summary, the proper use of media that will contribute to an integrated learning system will require that the coordinator select the most appropriate medium for the learners involved, the content to be presented, the behavioral objectives stated, and the immediate situation.

Principles of Selection

Selection of audio-visual equipment used to develop a multimedia component of an integrated learning system represents a major expenditure for a learning laboratory. It is recommended, therefore, that extensive consideration be given to the purposes and capabilities of such equipment before it becomes a part of the learning laboratory system. Guidelines for evaluating the usability and practicality of such equipment may be developed around three major areas: the learner, the laboratory, and the multimedia system.

The Learner

One necessary prerequisite to determining the applicability of equipment is to identify the learner population that will be using the equipment. Based upon the characteristics of this population--the stage of development of their physical skills, mental maturation, and psychological makeup--a decision must be made as to whether or not they can and will use the equipment.

The Laboratory

Any proposal for a learning laboratory will include certain parameters that must be considered in the selection of equipment.

Firstly, on a practical basis, can the laboratory afford the equipment? Secondly, will the equipment be used to a sufficient degree to justify the cost? No matter how much money is allocated for equipment, if the equipment will not be used, it cannot be afforded. Thirdly, can the operating budget maintain, service, and replace the equipment as needed? Too often, consideration is given only to initial costs. Replacement of parts, lamps, and other expendable items is costly and must be figured as a part of the operating costs of a laboratory.

Multimedia System

Another prerequisite determination to be made before purchasing audio-visual equipment is whether or not the equipment is consistent with the needs of the instructional program, based upon the objectives that have been developed to allow the learners to achieve their educational goals.

Finally, will the audio-visual equipment be suitable for presentation of the content of the programs to be established? In this respect, one must also ask if there is suitable software available for such equipment, and if not, can the software be locally produced in a feasible manner?

The Multimedia System

The success of the learning laboratory and the concept of individualized, self-paced instruction will depend partially upon the availability and use of media for instructional assistance. The four classifications of media presented may be utilized by the learner and the coordinator for learning, study, and the performance of

educational tasks. The multimedia systems package suggested is designed for a laboratory with a learner capacity of between 30-40. The package is a suggested system that allows for flexibility and breadth of service. The learner enrollment, budget, and laboratory instructional program needs will guide the coordinator in the acquisition of media.

The suggested multimedia system would include the following:

5 Cassette player-recorders with jacks

10 Cassette players with jacks

20 Sets of earphones

2 Tape recorders, reel-to-reel

1 Multispeed, stereophonic record player, with jacks

1 FM-AM, Multiplex radio with jacks

1 Television, color preferred, with jacks

1 Chalkboard

1 16mm movie projector

1 Screen for movie projector

5 8mm loop projectors

2 Filmstrip projectors

1 Overhead projector

1 35mm slide projector

2 Small projector screens

The foregoing equipment is basic for the operation of a full-time learning laboratory; however, certain other media may be utilized as needed if they are available from a central multimedia resources center.

Other equipment may be acquired in relation to the acquisition of certain self-contained instructional packages designed for individualized instruction. Several commercial films include the necessary media device as a part of the total instructional program. The instructional program to be offered and the needs of the learners will guide the coordinator in reviewing the expansion of the instructional program.

Supplemental Multimedia Equipment

The use of automated media as a part of the basic multimedia system is advisable provided it is practical and appropriate. The use of the following supplemental media requires a sizable investment in terms of time, funds, and personnel. The value of an expansion of the multimedia system will depend upon the availability of suitable instructional programs and the potential for learner utilization by the learning laboratory and the parent institution.

- Dial access learning systems provide for immediate and automatic access to audio-visual materials. The instructional programs may be requested by the learner from his carrel and received from a large studio type console center. This saves time and increases learner efficiency. There is less coordinator-learner contact which is sometimes desirable.
- Computer-Assisted Instruction -- This new, innovative, automated media system is expensive and requires a highly trained technical coordinator. The CAI system is

self-contained and offers a fast, efficient means of providing effective learning experiences. At present, there is a lack of instructional programs for the full development of this instructional media. More research will be required before this media can be fully utilized in the learning laboratory.

- Audio-Video--Recent advances have made the use of audio-video recording equipment a practical consideration. The ability to record on audio-video taped instructional programs, lectures, discussions, and other experiences has made this media effective. The tape may be played immediately, stored, or shown either to individuals or groups. Though expensive to purchase, it is durable and does not require a highly trained operator.

Other media are being developed; however, a word of caution is necessary. The media are no better tools to assist the learning process than the instructional programs they carry. Before considering acquisitions of any expensive, highly-specialized learning device, be sure the instructional programs they use are suitable, valid, and sufficient in number to warrant the investment for your learners.

CHAPTER 6

PHYSICAL FACILITIES

Introduction

As a guideline to designing and furnishing a laboratory that will be comfortable and functional for adults, major concerns regarding space requirements, furnishings, auxiliary services, and equipment will be discussed.

Requirements for physical facilities for an adult learning laboratory will vary with the purpose of the laboratory, its organizational affiliation, and the availability of space. Operations have, for example, been housed in places such as a church basement, business buildings, the YMCA, and within various existing educational institutions. Regardless of the location, recognition must be made of the different needs that adults have in terms of location and space.

The geographical location of the laboratory may be a major factor in teaching learners. Whenever possible, it should be located near the center of the learner population as accessibility is a key factor in recruiting and maintaining adult learners in a program. Also, the location should be chosen in relation to the transportation and parking facilities available to the learners.

Adults are more likely to be influenced by their surroundings than children and their motivation may be increased through adequate space, appealing decoration, and usable furnishings.

Furnishings

All adults are influenced by their environment. Therefore, in furnishing the laboratory, the needs of adults in a learning situation are important factors. The following suggestions have developed from the experience of a number of coordinators and are generally accepted as being beneficial to improving the instructional process.

- Carrels - For an individualized instruction program study carrels are generally considered essential as they provide a private work space that reduces the interruptive tendency generated in more open classroom situations. It is recommended that carrels selected for adults be no less than 34 1/2" wide by 22" deep. The partition separating carrels should be no less than 21" above the work surface. A narrow shelf, about 7" to 8" wide and 4" to 5" below the top of the back partition is a useful addition to the carrel. Because extensive use is made of electrical equipment, all carrels should be "wet"; that is, they should all have an electrical outlet, preferably a double plug-in placed in the upper right-hand corner of the work surface.
- Tables - Although carrels are generally preferred in a laboratory setting, some learners work more comfortably at tables. Since some people will have this preference, it is wise to provide work tables of

the library or conference types as a supplement to the carrels. To reduce the socializing tendency in the central study room, it is suggested that the size of the tables be such that they can accommodate not more than four or five people at one time. Also, the tables provided for learners should never be used for stacking materials or storage of equipment. The learner should be made to feel that the tables are for his use and convenience just as the carrels are. In determining the number of tables to be used in a lab, a good ratio seems to be about one table space for each two carrel spaces.

- Shelving - The choice of shelving for instructional materials will depend on the individual situation in regard to needs and resources; however, the reason for choosing shelving should be to make materials and/or equipment readily accessible and convenient for the learners. Therefore, the recommendation is that the shelves be lined up against a single wall or against two walls rather than in rows in the middle of the room. The wall arrangement seems to provide better accessibility and makes it easier for the learner to become familiar with the location of materials.
- Carpeting - In a laboratory operation where learners must move about frequently to get materials and equipment or to get help from a coordinator, carpeting

is not a luxury but a furnishing that makes a direct contribution to the learning process. The reduction in distracting noise and the atmosphere of warmth and intimacy that is created makes carpeting a sound investment for any laboratory. Any good quality indoor-outdoor type of carpeting in a subdued color and pattern will be a valuable asset.

- Desks - The choice of desks for coordinators will again depend upon the individual situation. All that is recommended is that each coordinator have a desk that is functional and, if possible, consistent with the decor of the laboratory.

Auxiliary Furnishings, Equipment, and Services

In addition to the basic space requirements and furnishings discussed, there will be a number of other items needed in the laboratory facility. These will vary to such a degree that it would be impossible to prescribe what should or should not be included. The following list, however, is provided as a checklist of items that may be needed:

- File cabinet(s)
- Storage cabinets
- Work tables for coordinators
- Bulletin boards
- Public telephone
- Coat racks

- Water fountain
- Heating and air-conditioning
- Electrical outlets
- Coffee facilities
- Vending machines
- Duplicating machines
- Restrooms
- Ash trays

Size and Arrangement of Space

The learning laboratory is unlike the traditional classroom in its arrangement or size. A learning laboratory requires a different arrangement of the space necessary for instruction. As a self-contained learning unit designed for individualized self-paced instruction, several space requirements and arrangements are desirable. Four specific areas form the basis for the ideal learning laboratory model. The following are thought to be minimal for a functional learning laboratory arrangement. Each reader is encouraged to consider these elements in the allocation of space for the various functions which are an integral part of the learning laboratory operation. The suggestions offered are designed to bring about the best conditions in which learning may proceed with maximum effectiveness and efficiency.

Study Area

Basic to the concept of the learning laboratory is the study area. This area is the largest single space requirement and is the center of the primary learning activity. The study area may have

various arrangements of its essential components: book shelves, individual study carrels, chairs, coordinator's desk, and tables for the various media.

The room should provide adequate space in order that the learners may move easily within the area. The recommended space requirement for a study area with a capacity of 30-40 students should be approximately 30 square feet per student. A room of approximately 900 square feet should be sufficient for 24 individual carrels for individualized study and three tables to accommodate 12 learners.

Group Study Area

This is the second largest space requirement in the laboratory. The group study area should have a table with chairs for group discussions. The room may be used for group meetings, guest speakers, showing films, testing, discussion sessions, and small classes. Students should be encouraged to use the room for any educational purpose that might bring them together with other learners, coordinators or guests.

The Socialization Area

This room should be set aside for learners to meet for coffee, snacks, smoking, and to enjoy informal discussion. The value of the learners' meeting and getting acquainted is valuable both to their instructional program and self development. A cheerful room with vending machines, coffee pot, magazines, and comfortable furnishings is often a welcome change during a break from studies.

The room should be located away from the study area so as not to disturb those working. The area should be convenient to the water fountain and restrooms. Smokers should be encouraged to smoke in the restroom rather than the learning laboratory study area.

The Administrative Area

This is an area which may be one or several offices for the director and coordinators. Each office should be equipped with the necessary office furnishings and one wall with a window for viewing the study area. The offices should be soundproof to provide privacy and to enable them to be used for counseling, interviewing, and testing as the need arises.

The administrative area serves as the center for the storage of tests, records, and individual student's files.

Storage

Space for storage of programmed instruction materials, audio and visual equipment, supplies, and other items is necessary. This same area may be used for repair, maintenance, and a work shop.

Testing Area

When space is available one or more rooms of small size (5' x 6') may be used for testing. This provides better control of the conditions under which learners will be expected to perform on examinations. On occasion rooms of this size may be used for counseling, interviewing, and other purposes as may seem appropriate.

The space necessary will depend on the number of learners, the available space, and the type of program of instruction offered. Examples of possible space arrangements are presented in Figures 6 and 7, pages 100, 101, and 102.

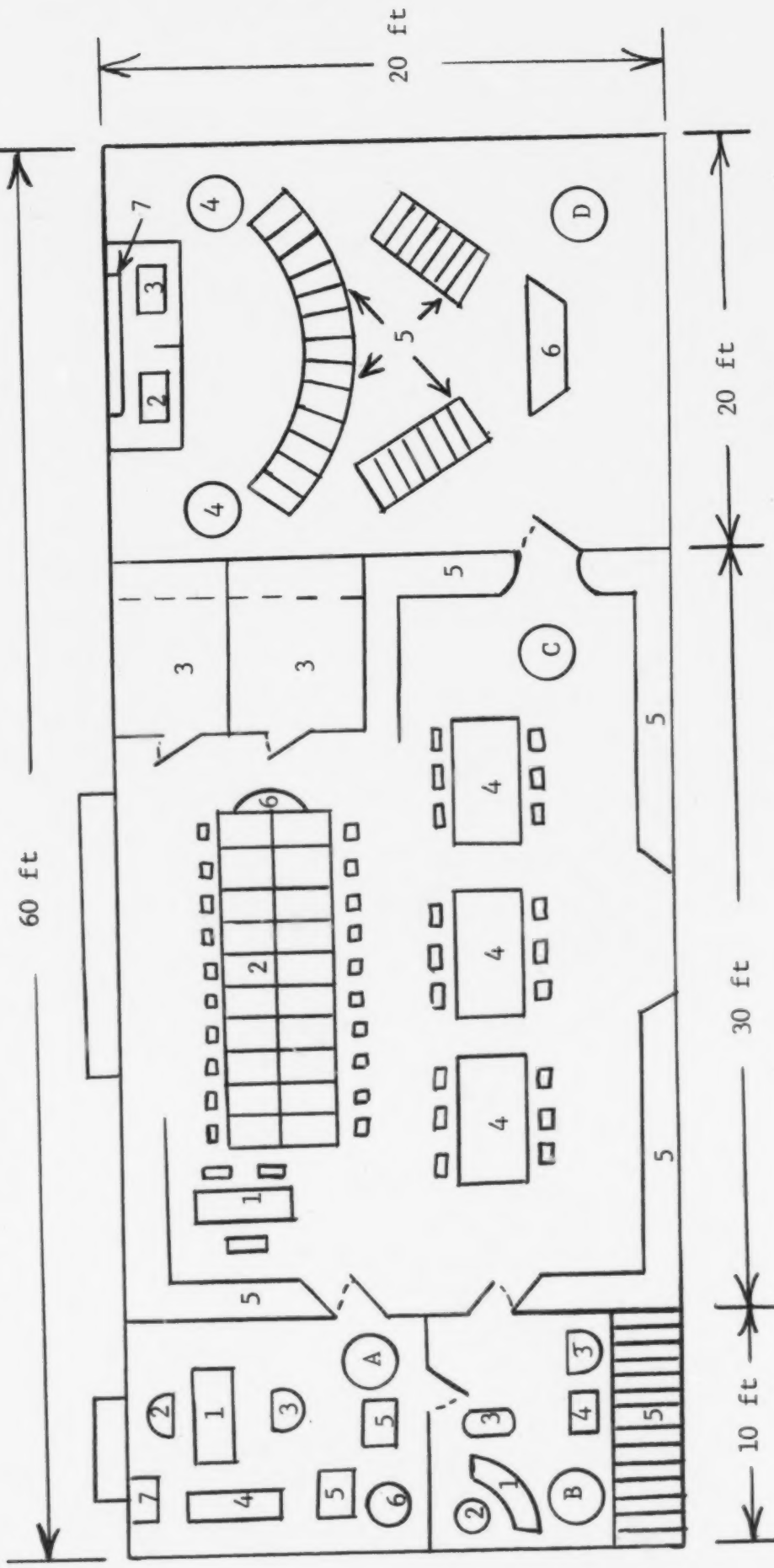


Figure 6. Rooms designed for individualized programmed instruction for 30-40 students

Figure 6

A - Coordinator's office

A-1 Desk
A-2 Chair
A-3 Chair
A-4 Bookcase
A-5 Upholstered chairs
A-6 Table and lamp
A-7 File cabinets

B - Office of para-professional, secretary, or aides

B-1 Secretarial desk and equipment (electric typewriter, calculator, etc.)
B-2 Secretarial chair
B-3 Upholstered chair
B-4 Table
B-5 File cabinets and/or supply cabinets

C - Individual instruction room

C Chairs
C-1 Table for tutoring
C-2 Wet carrels (wired)
C-3 Individual study booths - (unbreakable glass doors, atmospherically controlled, fully A-V equipped)
C-4 Large tables
C-5 Shelving and/or cabinets with counters and shelving above
C-6 Counter for Audio equipment

D - Visual center for individual or small groups

D-1 Small raised platform
D-2 Large color television
D-3 Stereo-record and tape console
D-4 Chairs
D-5 Sectional, movable seating with convertible desk tops
D-6 Projection table and storage for projectors, controlled readers, etc.
D-7 Screen

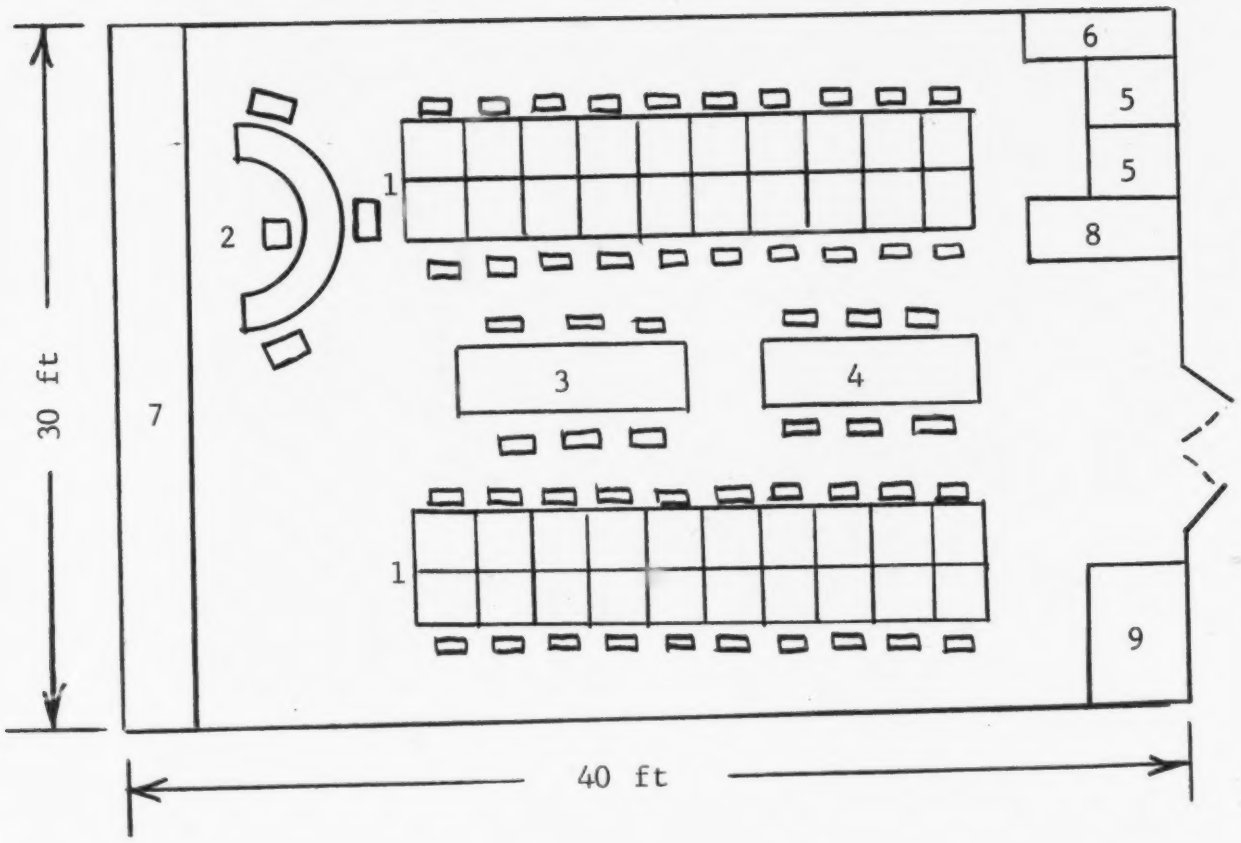


Figure 7. Classroom converted for individual instruction for 40 students

1. Carrels with electrical outlets
2. Semi-circular table for individual student coordinator activity
3. Wired table for audio (jack with earphones)
4. Wired table for A-V (short film strip Dukane, language master, etc.)
5. Filing cabinets
6. Sign in desk
7. Shelving for instructional materials
8. Coordinator's desk
9. Closet

CHAPTER 7

IMPLICATIONS FOR THE FUTURE

The movement in education toward more and more individualized instruction indicates that the future will require a wider and more extensive use of the learning laboratory and its related concepts--the "Learning Resources Center", "Multimedia Center", and "Independent Study Center". As programmed instruction becomes more sophisticated, as technology develops more alternative media applications, and as teachers are better trained to utilize the heretofore untapped, self-instructional capacity of learners, programs of individualized instruction are likely to become the core of the educational process at all levels.

The effectiveness of individualized programs in the future will depend first upon the improvement of programmed instructional materials. As Lawrence M. Stolurow of Harvard Computing Center comments:

> The decision to use PI in and for education is not simple or easy, but any doubts about its permanence or effectiveness would have to stem from prejudice or ignorance. The only course of action for areas of application is how to use PI most effectively, and the only course for research is how to improve upon what little

> we know so that we can begin to understand teaching and learning as they take place in schools, universities, and training establishments.

In accord with Stolurow's comment is the report by the Commission on Instructional Technology in which they strongly recommend increased federal expenditures for research and development of instructional technology as the key to truly individualizing instruction. As Hugh F. Beckwith, President, Beckwith and Associates, predicts:

> It is likely that in the next ten years breakthroughs in the use of lasers, improvements in data transmission, storage, and retrieval, will play a part in a more widespread and more sophisticated use of communications satellites for direct broadcasts to schools and homes. This, along with improvements in computers, tape players, and film projectors, will greatly increase the potential for individualized instruction in audio and video forms, programmed and nonprogrammed.

This forthcoming change in the concept of what instruction is and how it is accomplished will require more than improved instructional materials and technology; it will also require a new orientation for teachers. As pointed out in the annual report of the Northwest Regional Laboratory:

> Educators need to master new knowledge and acquire the enlarged capabilities for effective use of the new technologies.

The teacher of the future must be trained to function in a new environment that will be created by a transformed instructional process, if, as Marshall McLuhan contends, "...any technology creates a totally new human environment".

The extent to which these predications for the future come true will depend a great deal on the effectiveness with which the current

programmed materials and media are applied in the learning laboratory and other developing areas of usage. If these endeavors are proven to be successful methods of instruction, then more and better programs of individualized instruction may be expected in the future of education.

GLOSSARY

Multimedia - The unified use of printed, audiovisual and other technological forms of communication.

Learning Experience - The experience provided for an individual through a planned program of self-paced instruction designed to bring about a change in the learner's behavior.

Clientele - Individual (client) or group of learners who participate in the individualized, self-instructional program in the learning laboratory.

Educational Goal - The individual learner's expressed objectives to be achieved as a result of his learning experience.

Behavioral Objective - A precise statement that describes in observable and measurable terms the expected change in performance of the learner.

Behavior - Any observable activity displayed by a learner, i.e., psychomotor (skills), affective (attitudes), and cognitive (knowledge).

Terminal Behavior - The visible behavioral performance a learner should be able to demonstrate at the end of a specific period of time or program of instruction.

Entry-Level Behavior - Any observable activity (cognitive, affective, or psychomotor) displayed by a learner prior to an actual learning experience.

Programmed Instruction - Programmed instruction is a self-instructional technique from which students learn.

Carrel - An individualized, desk-size study area enclosed on three sides to provide privacy for the learner.

Media - The printed, audio, visual, audiovisual, and other technological forms of communication.

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APPENDICES

APPENDIX A

CHECKLIST FOR CLASSIFYING
PROGRAMMED INSTRUCTION
MATERIALS

Title of Course_____

Publisher_____

Date of Publication_____

Vendor_____

1. Format of course:
   a. Linear_____.
   b. Branching_____.
   c. Combination_____.

2. Responses required
   a. Multiple choice
      1) Written_____.
      2) Verbal_____.
      3) Manual_____.
      4) Other_____ (Specify type)_____.

   b. Constructed_____.
      1) Written_____.
      2) Verbal_____.
      3) Manual_____.
      4) Other_____ (Specify type)_____.

3. Media used
   a. Printed
      1) Book_____.
      2) Programmed text_____.
      3) Teaching machine_____.

   b. Graphic arts
      1) Slides_____.
      2) Pictures_____.
      3) Charts_____.
      4) Filmstrips_____.
      5) Video tapes_____.
      6) Film loops_____.

c. Audio
   1) Recorder_____.
   2) Radio_____.
   3) Cassette_____.
   4) Record player_____.

d. Audiovisual
   1) Sound Motion Picture_____.
   2) Television_____.

4. Types of learners course material appropriate for:
   a. Pre-school children_____.

   b. Elementary level:
      1) K - 2_____.
      2) 3 - 5_____.
      3) 6 - 8_____.

   c. Secondary level by grade:
      1) 9th_____.
      2) 10th_____.
      3) 11th_____.
      4) 12th_____.

   d. College level by year:
      1) Freshman_____.
      2) Sophomore_____.
      3) Junior_____.
      4) Senior_____.
      5) Post-grad_____. (specify year:_____).

   e. Adult learners
      1) Educationally deprived_____.
      2) Continuing education_____.
      3) Specialization of skills_____.

   f. Special student groups
      1) Retarded_____.
      2) With sensory impairment (deaf, blind)_____.
      3) Reading disability_____.
      4. Other_____. (Specify here:_____).

   g. Impossible to determine student level_____.

   h. Source of above information:
      1) By inspection of materials_____.
      2) From instructor's manual with course_____.
      3) Expert opinion_____.
      4) Other_____. (Specify here:_____).

5. Minimum reading ability necessary to use this course? (Check any below which apply).

   a. None_____.
   b. 1st to 3rd grade_____.
   c. 4th to 6th grade_____.
   d. 7th to 8th grade_____.
   e. Other_____. (Specify here:_____).
   f. Source of above information:
      1) From inspection_____.
      2) From experience with students_____. (How many? Fill in the number of students here_____).
      3) From expert opinion_____.
      4) From instructor's manual with course_____.
      5) Other_____. (Specify here:_____).

6. Prerequisite skills to use this course?
   a. Impossible to determine_____.

   b. None_____.

   c. Other skills needed are: (Fill in)
      _____.
      _____.
      _____.
      _____.
      _____.

   d. Source of information:
      1) From inspection_____.
      2) From experience with students_____. (How many? Fill in number of students here_____).
      3) From expert opinion_____.
      4) From instructor's manual with course_____.
      5) Other_____. (Specify here:_____).

7. Average length of time to complete these materials by a student with the prerequisite skills:
   a. About_____hours.

   b. Source of the time estimate above:
      1) From inspection_____.
      2) From experience with students_____. (How many? Fill in the number of students here_____).
      3) From expert opinion_____.
      4) From administrative manual with course_____.
      5) Other_____. (Specify here:_____).

8. Auxiliary learning materials provided with the course:

   a. None_____.

   b. Slides or transparencies_____.

   c. Filmstrips_____.

   d. Motion pictures_____.

   e. Audio tape_____.

   f. Texts or workbooks_____.

   g. Other_____. (Specify here:_____).

9. List of behavioral objectives. (Check one).
   Yes_____No_____.

10. The behavioral objectives are:

   a. Stated in unambiguous terms? Yes_____ No_____.

   b. Stated in performance terms? Yes_____ No_____.

   c. Stated with conditions of performance? Yes_____ No_____.

   d. Stated with levels of proficiency? Yes_____ No_____.

11. Pre-tests and post-tests:

   a. No tests supplied_____.

   b. Post-test only_____.

   c. Pre-tests and post-tests provided, and are identical_____.

   d. Pre-tests and post-tests provided, in equivalent forms
   _____.

APPENDIX B

CRITERIA FOR ASSESSING PROGRAMMED INSTRUCTIONAL MATERIALS

1962 Interim Report

JOINT COMMITTEE ON
PROGRAMMED INSTRUCTION
AND TEACHING MACHINES

This statement by the AERA-APA-DAVI Joint Committee on Programmed Instruction and Teaching Machines is concerned with educational techniques that are variously called "programmed instruction," "auto-instructional" methods, and "programmed learning."

The present statement amplifies and extends the previous guidelines published in 1961 by the Joint Committee.[1] This report, like the previous one, is addressed primarily to the nontechnical reader interested in the possible purchase of programs. It summarizes some basic aspects of the nature and current status of programmed instruction, and also presents some suggestions and cautions concerning the assessment of programs.

A subsequent, more technical report will provide supplementary information and recommendations addressed to the technical specialist who is directly concerned with obtaining or interpreting quantitative data to indicate the effectiveness of programs in contributing to specified instructional goals.

Programmed instruction. As used herein, programmed instruction refers to the use of materials or procedures which incorporate an "auto-instructional" (or self-instructional) program. Such a program commonly attempts to provide conditions under which a student can learn something efficiently with little

[1]This earlier statement by the Joint Committee was published in 1961 in the July-August issue of the Av Communication Review, the September issue of Audiovisual Instruction, and the November issue of the NEA Journal, as well as a number of other educational periodicals.

or no outside help. Current programs typically employ a prearranged sequence of material that is presented to the student one small unit at a time (e.g., a sentence or paragraph). Most programs require the student to respond actively at least once for each unit (or "frame") of material--for example, by composing or selecting an answer to a question. Programs also commonly provide prompt confirmation or correction, as the case may be, for each response the student makes. In some cases, the program is presented by a mechanism or device called a "teaching machine"; in other cases it is presented by a specially designed form of book.[2]

Some Basic Considerations Concerning Programed Instruction

With or without the use of "teaching machines" for controlled presentation of programs, individual instruction by programed materials offers a very important potential resource for education. Attention to the following guidelines is suggested, however, in order that the potentialities of programed instruction may be effectively developed and utilized.

Experimentation and planning for school use. Programed instruction represents a relatively new and thus far largely experimental resource for education. Experimental tryouts in schools, of both locally and commercially developed programs, is strongly encouraged. Wide-scale adoption of any particular program may well await the evaluation of one or more provisional tryouts of that program.

Curriculum planning. An important potential advantage of individual programed instruction is that abler learners can proceed at an accelerated rate through basic course material and thereby qualify sooner for advanced instruction. On the other hand,

[2]Detailed information about the development of teaching machines and programed-instruction concepts up to 1960 is contained in the source book, Teaching Machines and Programmed Learning, edited by Lumsdaine and Glaser and published by DAVI (724 pp.; $7.50). A briefer treastise is Teaching by Machine, by L. M. Stolurow, published in 1961 by the U. S. Office of Education and obtainable from the U. S. Government Printing Office (173 pp.; 65 cents). Reviews of several more recent books on programed instruction may be found in professional journals such as Contemporary Psychology, published by the APA, and the AV Communication Review, published by DAVI.

suitable programing may enable the slow learner to attain higher levels of proficiency than would otherwise be possible. Planning for adaption of curricula to accommodate these possibilities needs to be undertaken as programed materials of demonstrated quality become available.

Perfecting programs through tryout and revision. Programed instruction affords outstanding opportunities for perfecting instructional sequences through successive revision based on detailed records of student response to preliminary forms of a program. The development of high-quality programs will generally entail considerable effort and expense. However, if costs can be prorated over a large number of students, a greater research and development effort can be invested in a program than might otherwise be considered feasible.

Tests of program effectiveness. Although the content which a program is designed to teach may be inferred from careful inspection of the program itself, external evidence based on student performance is needed to demonstrate how well the program actually teaches. However, the value of a method of instruction cannot be tested in the abstract. For example, evaluation of a particular textbook is not an assessment of the usefulness of textbooks in general. A properly constructed experimental tryout or field test of a program may provide an assessment of that particular program, but does not afford proof or disproof of the value of a general "method" of programed instruction.

Experimentation conducted thus far supports the expectation that good programs, carefully developed, can significantly improve both the quality and economy of instruction. Whether any particular program will do so is subject to question until established by adequate tests of that program. Unfortunately, programs may be offered for sale that will fall short of the potential value of programed instruction--for example, because they have not been carefully developed through procedures that include sufficient tryout and revision to assure their effectiveness.

"TEACHING MACHINES"

Some programs require a machine for their presentation, while some are available in two separate versions, one in book form and the other for use with a machine. In any case, it should be emphasized that so-called teaching machines, in themselves, do not teach. Rather, the teaching depends on the

program of instruction materials that may be presented by a machine. The comparative merits of machine and nonmachine presentation of printed programs for use in schools is as yet an unresolved issue. Any advantage for machine over book presentation cannot be tested in the abstract but would depend on the characteristics of a particular machine. Some machines have demonstrable advantages for certain uses, including research; and suitable machines are required for programs that utilize audio materials.

Machine characteristics. The variety of types of teaching machines continues to proliferate, with little standardization. In evaluating any make or model of teaching machine, a continuing necessity is thus to assess the number and quality of programs available for use in it. For some machines the user who has sufficient time and skill can prepare his own programed materials; for other machines this may not be feasible. With some machines, a program can be reused indefinitely; for others, a new copy of the programed material may be required for each student.

For many machines, mechanical dependability cannot yet be taken for granted. As with any new mechanical device, potential purchasers of teaching machines are well advised to seek reliable information on how extensively the device has been used in schools, what maintenance problems have been encountered, and the extent to which parts and service are locally available at reasonable cost.

Availability of machines. Existing machines differ greatly in complexity and cost; prices for most of them range from a few dollars to several hundred dollars per machine. Any catalog of teaching machines is likely to be obsolete as soon as it is printed because the field is developing so rapidly. New machines appear, and some advertised models fail to get into production. Several dozen different machines are briefly described and illustrated in a 1962 publication by Finn and Perrin.[3] A number of

[3]Finn, J. D., and Perrin, D. G. Teaching Machines and Programed Learning 1962: A Survey of the Industry. Occasional Paper No. 3, NET Technological Development Project. Washington, D. C.: U. S. Government Printing Office, 1962 (Publication No. OE-34019; 85 pp., 55 cents). See subsequent footnote concerning information presented in this report.

these are commercially available at present. Others have been withdrawn from the market or were experimental models that have never gotten into production.

PROGRAMS

Availability of Programs

An increasing number of programs is becoming commercially available in a variety of subject-matter areas. Mere availability is no guarantee of quality, however. In addition, programs (as well as machines) are sometimes announced long before they are actually available; also, as noted above, some programs are in a format that can be presented only with a particular kind of machine.

A useful guide to available programs for school subjects is a 814-page government publication entitled Programs, '63.[4] This publication lists some 400 programs reported to be commercially available by September 1963. These programs span the curriculum from elementary to college levels and cover a variety of subject matter, including language arts, mathematics, music, physical and biological sciences, social studies, and business education. The report cited includes descriptive information and one or more sample sequences from each program. Pertinent data given include the intended student population, the number of "frames" in each program, and its price, but no attempt is made to evaluate the programs.[5] It is anticipated that this compilation will be updated by similar guides for subsequent years.

Types of Programs

Programs are being produced in a variety of forms. Thus far they have tended to cluster around two or three main types; however, new variants or mixtures of types are also being introduced. The majority of current programs break the subject matter down into a large number of small steps or "frames,"

[4]The Center for Programed Instruction, Inc. Programs, '63: A Guide to Programed Instructional Materials. Washington, D. C.: U. S. Government Printing Office, 1962 (U. S. Office of Education, Publication No. OE-34015; 814 pp., $2.50). See following footnote concerning information presented in this report.

[5]The reports on devices and programs identified in the two preceding footnotes are cited solely for the convenience of the reader, and statements concerning them are not to be construed as an endorsement by the Joint Committee or its parent organizations, either as to completeness or accuracy of the information presented, or of the quality of the devices and programs listed in these publications.

requiring the student to make one or more responses to each step. Such a program can be so designed that the student will respond to critical aspects of each frame or will get practice in performing the specific operation that each frame is meant to teach. Careful programing requires the programer to take great pains to insure that these steps embody a logical, well-sequenced progression of the subject matter. This applies especially to programs that are intended to serve as sole or independent sources of instruction rather than only as supplements to other material. Such programs often provide a number of examples to illustrate each principle, concept, or act that is to be learned.

Programs of the kind described above are designed to adapt to individual differences by allowing each learner to proceed at his own rate. In addition, some types of programs further adapt by providing for "branching" to alternate materials. For this purpose, frames may include questions designed to diagnose the learner's needs, with directions taking him to alternate material suited to these needs.

In most of the current "branching" programs, the program is so constructed that the choice of a particular answer to a diagnostic question determines which frame will be presented next. Incorrect answers may take the student to frames containing information designed to correct the error before allowing him to continue through the sequence, or to frames that provide supplemental information or practice.

There is little empirical basis at present to favor one general type of program over another. It may be anticipated that different types of programs will eventually prove to be especially useful for particular kinds of educational purposes, and that different styles of programing may be combined effectively in a single program. At the present time, however, the general pattern of one type or another of programing may be superficially followed without necessarily capitalizing fully on its potential advantages.

CRITERIA FOR ASSESSING PROGRAMS

A useful distinction can be made between "internal" and "external" characteristics which might serve as possible criteria for program evaluation.

"Internal" and "External" Sources of Information About Programs

"Internal" characteristics refer to features that can be revealed through visual inspection of the program. These include both the content of the program and the way the program is constructed. Content might be described in terms of relative emphasis given to various topics as well as general

organization of the material. Descriptive characteristics of program construction might include information about the length of frames, use of branching sequences, techniques of prompting, patterns of repetition and review, modes and frequency of response called for, procedures and scheduling of reinforcement, and the like.

"External" information about a program refers to features which cannot be observed merely by inspecting the program itself, such as the way it was developed and characteristics of its performance as a teaching instrument. External information of interest to a potential purchaser could include such things as the source of program content, qualifications of authors, history of the program's development, tryout and revisions, and test data indicating gains in achievement produced by the use of the program. This information, as indicated more fully below, may be presented in a descriptive manual supplied by the program publisher.

Critical reviews of programs may furnish an additional basis for evaluation. Such reviews are beginning to appear in professional journals along with reviews of textbooks. (Some reviews include data on achievement attained by using the program as well as the reviewer's opinion about program content and style.

Programs as Related to Textbooks and to Tests

The applicability of internal and external kinds of information as possible criteria for evaluating programs may in part be seen by comparing programs with textbooks and also with educational or psychological tests.

Programs as compared with textbooks. Both programs and textbooks may be inspected to determine what topics are covered and the relative amount of attention given to each. Such inspection would also indicate whether the subject matter is factually correct, whether it is current, etc. However, despite their similarities, programs differ from textbooks in several important respects that may affect their evaluation. A program's requirement for frequent student response generates a special source of data useful for revising the program in detail. The tendency to empirically guided development of programs is coupled with an orientation toward testing the specific effects produced by a program, and toward more sharply focused objectives defined in terms of specified behavioral outcomes. In addition, the program is intended to generate a

more predictable pattern of student behavior than does the study of a textbook, which generally has a less specialized purpose in aiming to serve as a reference source as well as a sequence of instruction.

Programs compared with psychological and educational tests. Although programs aim primarily to instruct students rather than to test them, programs and tests share some important attributes. Since both generate student-response data as an inherent feature, both tend to be developed in terms of empirical procedures. The difficulty of each item in a program, as in a test, can be investigated by presenting the program to appropriate samples of students and recording their responses. Both the program and the test have limited ranges of usefulness that can be described to the potential user in terms of empirical evidence; and in both cases it is possible to specify an external criterion to indicate the extent to which some intended outcome is achieved, as evidenced by the kinds of behavior that have been developed or differentiated.

Uses of Internal and External Information for Assessing Programs

Inspecting the subject-matter content of programs. At the present time, the principal recommended use of internal data obtained from inspection of the programed materials is for determining whether program content is appropriate to the educator's objectives. As with other educational materials, program titles often are not definitive. Programs labeled with the name of a particular subject matter can vary widely in terms of content and associated instructional objectives.

The prospective purchaser of a program should, therefore, inspect the content of the program at least as carefully as he would that of a textbook. Preferably he should go through the entire program to determine what aspects of the subject are treated or omitted, and to the extent to which particular subtopics are developed.

Limitations of program inspection. A risk in relying on inspection for evaluating a program is that one's perception of its value may be inappropriately influenced by his reaction to particular structural features of the program. For example, certain frames or items may seem too difficult or too easy. However, the difficulty and appropriateness of items in a program, like those in a test, generally cannot be judged accurately by inspection alone. External

data are needed--data from an actual tryout of the program on students who are representative of the population of intended users.

The need for test data to assess a program's effectiveness. Empirical evidence on what is learned from the program can also be a better basis than mere inspection for answering such questions as whether program sequences have too much or too little repetition, review, prompting, overlap of steps, etc. At present, the scientific evidence is not considered sufficient to permit accurate prediction in these respects or to justify recommendation that adherence to specific rules or program construction be used as a basis for program evaluation. External evidence is recommended as the main basis for the evaluation of program effectiveness--in particular, test data obtained from using a program under specified conditions which provide dependable measures of gains produced in student achievement and of the time students require to achieve these gains.[6]

Uses and assessment of programs. Programs may have a variety of uses. For example, they may be intended to provide the main source from which students are expected to learn facts, principles or skills--or they may be intended only to review or introduce other instruction. In most schools, programs will probably be used in conjunction with other media of instruction. However, no matter what eventual use is comtemplated for a program, it will generally help a prospective user to know what the program itself actually contributes to the students' knowledge or proficiency--in addition to what is contributed by other elements in the instructional situation.

The kinds of effects that can be revealed through empirical tryout are limited by the content of the achievement tests or other measures used to assess these effects. Inspection of the program by the prospective purchaser, supplemented by independent

[6]This emphasis on external criteria for assessing program effectiveness is consistent with the position earlier advocated in Lumsdaine and Glaser's 1960 "Concluding Remarks" (op. cit., p. 566), and in Rothkopf's 1961 conference report, "Criteria for the Acceptance of Self-Instructional Programs." Improving the Efficiency and Quality of Learning. (Edited by A. E. Traxler.) Washington, D. C.: American Council on Education, 1962. pp. 30-38.

professional reviews (when available) may sometimes suggest additional uses for which a program might be suitable, or kinds of program effects which are not indicated by field-test data because they were not contemplated in the programer's original purpose.

Inspection of achievement-test content. Aside from the data obtained in testing a program's use under laboratory or field conditions, inspection of the program itself as a basis for appraisal can be supplemented if the author or publisher has spelled out the program's purpose by describing and exhibiting in full the achievement-test items which purport to exemplify what the program is intended to teach. These criterion-test items, as well as responses called for by the program and test, can be examined to see what the learner is required to be able to do, and whether this reflects the kind of competence which the educator wishes to achieve. Such an analysis of test content as a basis for determining a program's objectives may be particularly helpful for programs which are intended to serve as a primary source of instruction rather than merely as an adjunct to other instructional material.

REPORTING DESCRIPTIVE INFORMATION ABOUT PROGRAMS

Manuals for Providing External Data

"Manuals" for tests and programs. Because some of the characteristics needed to appraise educational and psychological tests are revealed only through data obtained by using them, it has become accepted practice to furnish information about test characteristics in a manual supplied by the test producer. It appears both desirable and feasible to provide a similar manual for programs as a vehicle for presenting relevant external information about properties which are not apparent on inspection.

Questions that might be answered about a program. Information presented in a manual can help program producers or distributors to answer questions which the prospective purchaser may wish to ask as a basis for selection. Several areas of such questions concerning external information about a program may be identified. These questions might deal with (1) the program's purpose and intended use, (2) the source of program content, (3) the way the program was developed, including tryout and revision, and (4) the conduct and results of testing to determine empirically the effectiveness, or "performance characteristics," of the published program. The last of these kinds of information will generally

be considered the most important; however, it also involves the kind of data which may be hardest to evaluate as to adequacy without specialized technical advice.

Purpose and Scope of a Program Manual

The kind of manual here suggested could apply to all types of programed materials. However, some of the details appropriate for some programs probably would not apply to others. For example, less test data would probably be needed in the case of very short programs.

It is expected that the main user of such a manual would be the school district or other large-scale purchaser interested in buying programs in considerable quantity. To evaluate fully some of the data that could appropriately be included would generally require advice from a technical consultant who has professional training and competence in testing and measurement techniques as well as in statistics and experimental design. However, the manual also could well supply general interpretive information to help the nontechnical purchaser determine the program's relevance to his educational purposes. Such information could precede and refer to, when appropriate, the presentation of the technical detail needed for the specialist to appraise a program's effectiveness.

Program "labels." In addition, a digest of the information in the manual might be presented as a brief preface or "label" attached to individual copies of the program. Such a label could, at a minimum, indicate the purpose and intended use of the program, who was primarily responsible for its content and preparation, and the source of publications in which further data on its development and effectiveness might be found. This information should include the age or grade level(s) of the learners for whom the program is designed, and the prerequisite skills and abilities these learners are assumed to have. The publisher could then characterize and briefly illustrate the kind of competences the program has been demonstrated to produce when used in the manner suggested.

Further Information on Source and Development of Program Content

A more detailed manual which could be supplied by the program publisher to prospective users on request might elaborate this minimum information in relation to further questions, such as the following, which concern the source and development of program content.

Sources of content. What textual or curriculum sources were used in the selection and development

of the content? How current were these sources? Who were the programer(s) and the collaborating curriculum specialists or subject-matter consultants (if any) that prepared, edited and reviewed the program materials? What are their academic and experience qualifications with respect to competence in the subject matter and techniques of programing? To what kind of review was the program material subjected during its development?

Development, tryout, and revision. As previously noted, records of learners' responses to preliminary versions of a program can provide a basis for its progressive revision and improvement prior to publication. Accordingly, the prospective purchaser might wish information about the extent to which such tryout and revision has been conducted, the kind and amount of student-response data obtained, and the way in which the data were used in revising the program. The manual might also indicate the criteria used to determine when the program was ready for final release and printing prior to the effectiveness testing on which the performance characteristics of the published program are based. As supplementary information, the producer might also wish to indicate the assumptions made and principles used in constructing the program.

Information About the Demonstrated Effectiveness of a Program

It is to be hoped that the manual for a program, at least for major programs of considerable scope, will furnish evidence on the program's effectiveness based on measurement of student performance on pre- and post-program criterion tests. These tests should be exhibited either in the manual or in an available supplement, so as to exemplify what the producers expect the student to learn as a result or program use.

Program producers are strongly encouraged to support any claims for the effectiveness of the programs in terms of gains in student performance produced by the final, published version of the program, as revealed by appropriate criterion tests. A clear distinction should be made between this effectiveness-test data for the final program and any test data obtained in earlier tryouts of preliminary versions used on a basis for revision. (Changes made in the program after the latter effectiveness-test data are obtained could throw doubt on the validity of these data for a demonstration of the program's effectiveness.)

The manual should present whatever further information would seem helpful in evaluating the reported

effects of the program or the adequacy of the evidence on which they are based. It should in all cases present evidence to document for the technical reader that the gains in achievement reported can rightly be attributed to the effect of the program's use rather than to extraneous causes. In addition, it should describe the physical and social conditions of the program's use and effectiveness-testing procedures in sufficient detail so that their essential features could be reproduced by another investigator if desired. This information would include details of supervision and incentives used, other instruction given, size of student groups, and physical arrangement of rooms during program use and testing. Any material discrepancies between recommended conditions of use and those that were employed in obtaining the effectiveness-test data should be noted. Students' prior experience with programs and teaching machines, if any, should be noted in view of spuriously large temporary gains that can sometimes result as a novelty effect when a new device or procedure is first introduced.

The manual should indicate how many of the students started and completed the program, the average length of time they required to finish it, the average level of performance on the specified pre- and post-program tests of achievement, and the range or variability with respect to these measures. Relevant further temporal data would include the amount of time learners of different ability spent on various portions of the program, how this time was distributed (especially for long programs), and the time lapse between the completion of the program and the criterion test.

Effectiveness tests could of course be conducted so as to include post-program measures other than the test that specifies the programer's objectives. The program's effect on secondary objectives not originally aimed at could thus also be revealed. However, whether or not such tests are conducted by the producer or by others (e.g., by a prospective user or by an independent research agency), it is to the programer's interest to specify what he intended as the program's principal objectives. Finding a program to be ineffective or of only limited effectiveness for contributing to a secondary or unintended objective might be helpful to the user in making a decision about the use of the program for that purpose, but cannot properly be held as a criticism of the programer's effort.

It is anticipated that a school district contemplating the use of a program will be interested in its effect on performances other than those tested by the program producer. Particularly in this case, it is recommended that, when possible, potential users assess a program by their own field tests, guided by suitable technical consultation, before deciding on adoption of a program for wide-scale use. Performance characteristics of a program could specify its effectiveness in affecting behavior of students describable as changes in knowledge, understanding, skill or other outcomes, including beliefs, interests, and motivations.

Learner characteristics. Specification of prior knowledge and ability of learners can serve both to identify the pre-program base line from which gains may be measured, and also to indicate what prerequisites are needed in order to learn effectively from the program. Learner characteristics may be specified as an aspect of the program's purpose and intended use. The corresponding characteristics for the samples of students used in preliminary tryouts or, particularly, in the effectiveness-testing of the program, should be separately specified so as to indicate the degree to which these learners were typical or atypical of the learners for whom the program is intended. The producer should also indicate the limits (particularly the lower limits) of the population for whom the program is intended, and of the samples used in testing its effectiveness.

Technical information concerning the conduct of effectiveness-testing. Valid assessment of what is taught by the use of a program generally involves special technical problems. Evaluation should, whenever possible, utilize the assistance of technical specialists having recognized competence in educational measurement and experimental design. The analogy of programs with standardized educational and psychological tests also suggests a precedent for preparation of technical recommendations by members of relevant professional organizations. These recommendations can serve both to help insure the technical soundness of effectiveness-testing procedures, and to promote comparability and interpretability of data by fostering consistently high standards or practice in reporting the results of tests. The further interim report to be published at a later date by this Committee will

discuss in more detail some of the technical problems of assessing what the use of a program, in and of itself, contributes to definable instructional goals.

APPENDIX C

HOW TO SELECT AND EVALUATE PROGRAMMED INSTRUCTIONAL MATERIALS

The large number of programs available at all educational levels presents the teacher with a major selection problem--which should she choose for her students? By sharing with the teacher the validating data that led to his decision to publish a given program, the publisher can help the teacher answer her question. Some publishers make this type of information available in separate evaluation reports of the programs that it markets. The purpose of the present discussion is to explain the assessment procedures that publishers should use in order to assure publication of only high quality programs and to share this information with educators to the benefit of their students. We shall now consider the various criteria for assessing the quality of any given program.

Pre-Classroom Testing Criteria

Programming Technique. Programmed learning has resulted in many products of widely varying programming quality. When a publisher first receives a program, it should be checked over by a programming expert to ascertain whether or not sound principles of programming technique have been used by the author. Only those programs that have superior programming characteristics should be further considered.

Subject-Matter-Expert Evaluation. The next step is to have the program thoroughly studied by one or more subject-matter experts. A

decision is rendered as to whether or not the program is academically sound, whether or not the terms, principles, mechanics, etc. are up-to-date, and so forth. Finally, the subject-matter expert decides whether or not the content of the program is appropriate for a specific educational curriculum. Providing that the program passes these first two tests, it is then objectively tested in a classroom situation.

Assessment in a Classroom

Efforts are made to select samples that are representative of the population for which the program is intended. Hence, appropriate grade levels and classes are chosen, the I.Q.'s of the "experimental" students are ascertained to make sure that they are nationally typical, and so forth. See Appendix A for an example of a form which might be used for the collection of important student and student performance information.

Once appropriate samples are selected, the students are administered an objective achievement test as a pre-test. Following this they work through their programs, usually at their own rate. During this learning period attempts are made to minimize the effects on the students' learning of all variables other than the program itself, e.g., the activities of the teacher are restricted to procedural matters and the students work on their programs in the classroom under the teacher's supervision. Once the students have completed their programs, they take the achievement test again as a post-test.

Finally, the students and the teachers complete standard program evaluation forms (See Appendices B and C).

The data gathered from the pre- and post-tests, from the student's actual work in his program, and from the evaluation forms are then analyzed. A final publish-no publish decision is made according to the following criteria. These criteria are guidelines that the teacher might profitably use in helping her decide whether or not to adopt a given program.

Classroom Testing Criteria

Learning Data. The primary purpose of the program is to teach--if the student does not learn a substantial amount from the use of the program, the other criteria may be disregarded. The question, then, of how much students learn from the use of a program is much more important than all of the other criteria combined.

To assess amount learned as accurately as possible we have developed a ratio which we call G (McGuigan and Peters, 1965). To better understand G let us refer to Table 1. Suppose that it is possible to score 100 points

Table 1

Learning Data Analysis (Means)

Possible Score	=	100
Pre-Test Score	=	20
Post-Test Score	=	85
Gain Score	=	85 - 20 = 65

continued

$$\text{Possible Gain Score} = 100 - 20 = 80$$

$$\underline{G} = \frac{\text{Gain Score}}{\text{Possible Gain Score}} = \frac{65}{80} = .81$$

on the achievement test; in this case, the possible score is, obviously 100. Now suppose that a class makes an average score of 20 before the program was taken (the pre-test score) and of 85 upon completion of the program (the post-test score). The gain score can thus be seen to be 85 minus 20, or 65. Next we ascertain the possible gain score, i.e., the maximum amount of gain that the students could have demonstrated. This value is the possible score (100) minus the pre-test score (20), which is 80. Now, to compute the ratio, G, one merely needs to divide the possible gain score (80) into the actual gain score (65), resulting in this example in the value .81.

With this understanding of how to compute the gain-to-possible-gain ratio, G, let us now consider how this value helps us to answer our major question of whether or not the students learned a sufficient amount from the use of any given program. Put otherwise: is any given value of G (e.g., .81) sufficiently high that we can conclude that the program led to an adequate amount of learning? To answer this question, we have constructed a frequency distribution of G scores for a number of programs that have been tested to date (Figure 1). Note that G typically varies between 0.0 and 1.0 such that the higher the G value, the greater the learning. By studying the G scores that make up the frequency distribution presented in Figure 1 we can see, for instance, that one program yielded a value within the .10 and .19 category, that two programs had G values of .20 to .29, and so forth. Now, to answer our question, note that the G value for our

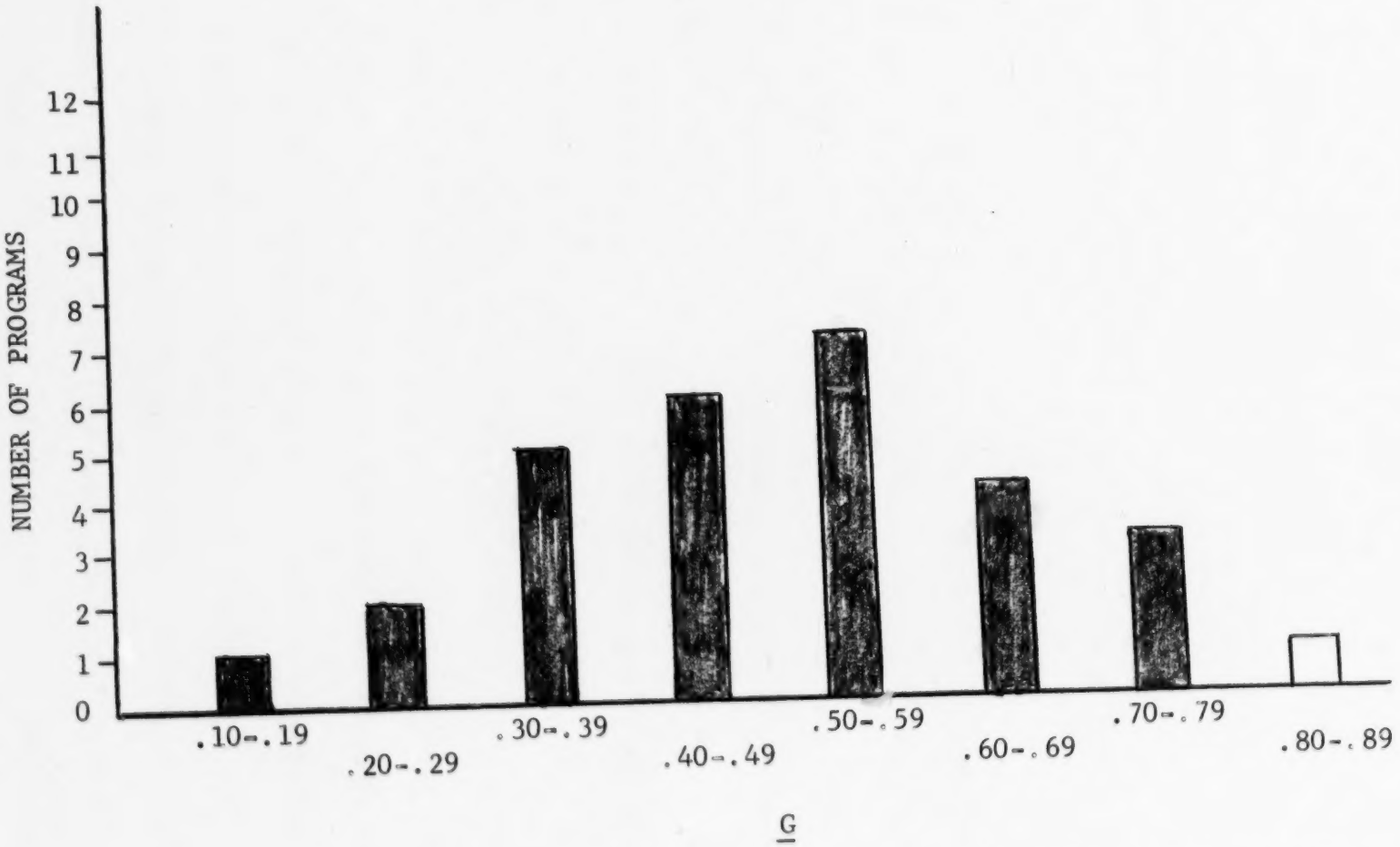

Figure 1. Frequency distribution of gain to possible gain ratios (G) for 28 programs previously tested. The non-shaded region locates the G value for the test program at a very high position relative to the other programs tested. (The 28 programs previously tested were not tested by the author under the aegis of the Adult Learning Center.)

hypothetical program is located within this frequency distribution by means of the unshaded region. Since this value of .81 is a high one, relative to G resulting from the other programs tested, we may conclude that this program led to a relatively superior amount of learning.

Student Evaluations. It has been shown that student reactions are positively related to amount learned (McGuigan and Peters, 1965) and, in any event, one should prefer using programs that students regard as enjoyable and beneficial. The standard student evaluation form includes six items on which students rate the program. In using this criterion, we compare the student reactions to a test program with all student reactions to previous programs that have been tested. That is, we sum the student reactions for all programs tested to date and then compare their reactions to the program currently undergoing testing (McGuigan and Peters, 1965). Consider Table 2 as an example. We can see that 68 percent of the 1489 students who studied a variety of programs indicated that they learned more because a program was used in their course. In contrast, 81 percent said that they learned more because the test program was used. We may thus regard the student reactions to the test program in this example as being relatively favorable. Each report of the validating data for any given program presents these kinds of findings in detail.

Teacher Evaluation. The teachers' reactions, as recorded on standard evaluation forms, are verbally summarized in each report.

Error Analysis. Research has also indicated that the higher the error rate, the less the learning (McGuigan and Peters, 1965). This

Table 2

Student Reactions to Test Program

Question # 1: Because a program was used in this course, I believe:

	N	I learned more	It made no difference	I learned less
31 Programs	1489	68%	19%	13%
Test Programs	59	81%	7%	12%

finding is consistent with principles of learning (especially of the Skinnerian variety). Hance, both empirical and theoretical considerations indicate that the error rate for a given program should be relatively low. To ascertain the mean error rate, the responses that the students wrote in their programs are carefully checked and the number of errors is counted for each student. The mean number of errors is then determined for the entire sample of students, and this value is divided by the total number of responses called for by the program. The resulting value is the mean error rate. Figure 2 presents a frequency distribution of mean error rates for programs that have been previously tested. Figure 2 can now be used to determine whether or not the error rate for a given program is excessive. For example, suppose that a program yielded a mean error rate of 2.3 percent. This value, represented by the unshaded region in Figure 2, can be seen to be a low one, relative to the mean error rates for the entire sample of programs.

Concluding Statement

In summary, then, one who is considering adopting any given program should first request and examine the learning data made

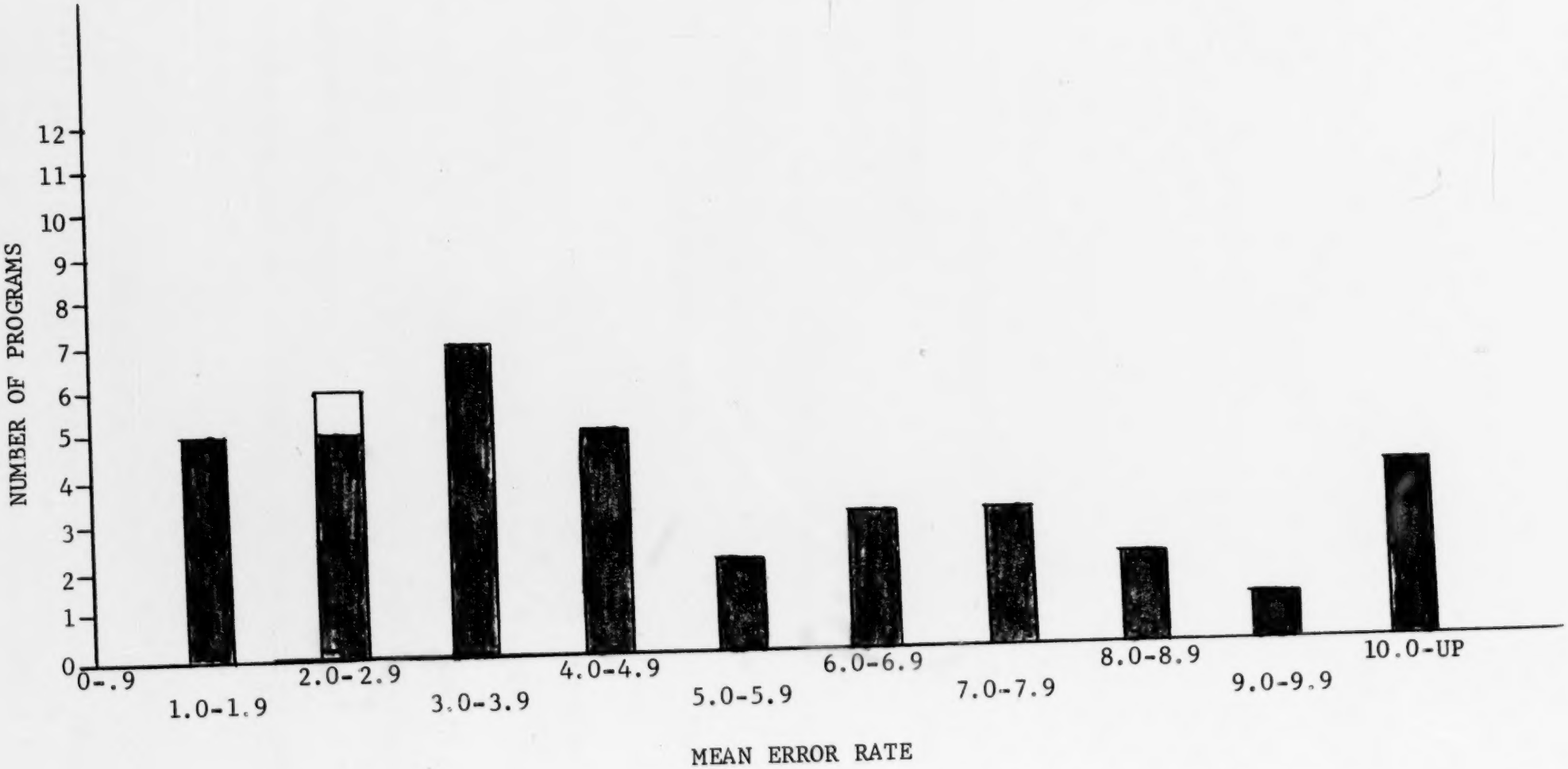

Figure 2. Frequency distribution of mean error rates for 36 programs previously tested. The non-shaded region locates the value for the test program for this measure at a very low position relative to the other programs tested. (The 36 programs previously tested were not tested by the author under the aegis of the Adult Learning Center.)

available by the publisher. Program and learning data obtained from publishers should, as much as possible, conform to the Recommendations for Reporting the Effectiveness of Programed Instruction Material prepared by the Joint Committee on Programmed Instruction and Teaching Machines. If the information obtained indicates that the students learned a considerable amount from the use of the program, consideration may then be given to the more subsidiary criteria, i.e., has the content of the program received the approval of subject-matter experts, are the teacher and student evaluations of the program favorable, and does it have a low error rate? The program that best satisfies these criteria should be the one favored for adoption.

References

McGuigan, F. J. and Peters, R. J., Jr. Assessing the effectiveness of programmed texts--methodology and some findings. Journal of Programed Instruction, Volume III, No. 1, 1965.

Recommendations for Reporting the Effectiveness of Programed Instruction Materials, Prepared by the Joint Committee on Programmed Instruction and Teaching Machines, Division of Audiovisual Instructional Service, National Education Association, 1966, pp. 1-35, Washington, D. C.

STUDENT TIME LOG AND GENERAL INFORMATION FORM

Title of Program_____ Sex_____

Name of Student_____ Race_____

Highest Grade Completed_____ Age_____

Tested Reading Level_____ I.Q._____

Study Time in Hours and Minutes:

Date & Day	Time Started	Time Stopped
_____	_____	_____
_____	_____	_____
_____	_____	_____

TEACHER EVALUATION FORM

Title of Program_____Name of Teacher_____

The following questions were designed to help us evaluate the program that you have just gone through with your class. The information that you can furnish will be of great value to us. For each question please check the blank that you feel most adequately describes your opinion. Blank lines have been provided below each question for you to qualify or elaborate your answers. Please feel free to make any comments that will aid us in determining the value of this program.

1. Is the subject-matter of the program academically sound?

_____ Yes

_____ No

_____ Undecided

Comments:_____

_____

_____

2. Was the level of the subject matter appropriate for your class?

_____ Too difficult

_____ Appropriate

_____ Too Easy

Comments:_____

_____

_____

3. As contrasted with what you have been able to accomplish with other types of learning material, how much do you feel you were able to get your pupils to learn with this program?

_____ A great deal more than with most other materials.

_____ A little more than with most other materials.

_____ About as much as with other materials.

_____ A little less than with most other materials.

_____ So little as to be a waste of time.

Comments:_____

_____

_____

_____

4. The next time you teach a course in this subject or a similar field, would you:

_____ Prefer to have programs used for at least part of the course?

_____ Prefer not to have programs used?

_____ Don't care whether programs are used or not?

Comments:_____

_____

_____

5. To what extent did you enjoy using this program with your class?

_____	_____	_____	_____	_____
Very Unenjoyable	Unenjoyable	50-50	Enjoyable	Very Enjoyable

Comments:_____

_____

_____

6. Do you think this program should be made available for the use of teachers throughout the country?

_____ Yes

_____ No

_____ Don't Know

Comments:_____

_____

_____

7. In your own words, would you please summarize your opinion of this program. Include statements about its strong and weak points.

STUDENT EVALUATION FORM FOR_____

1. Because a program was used in this course, I believe:

_____ I learned more.

_____ It made no difference.

_____ I learned less.

2. In comparing work done using the program with studying in regular textbooks, I feel that, with the same amount of time and effort:

_____ I learned much more with the program.

_____ I learned somewhat more with the program.

_____ There is no difference.

_____ I learned somewhat more from studying textbooks.

_____ I learned much more from studying textbooks.

3. If I were to take another course in this subject or a similar field, I would:

_____ Prefer to have programs used for at least part of the course.

_____ Prefer not to have programs used.

_____ Don't care whether programs are used or not.

4. How much do you think you learned from this program?

_____	_____	_____	_____	_____
Learned nothing	Learned a little	Learned a medium amount	Learned quite a bit	Learned very much

5. To what extent did you enjoy going through this program?

_____	_____	_____	_____	_____
Very Unenjoyable	Unenjoyable	50-50	Enjoyable	Very Enjoyable

6. To what extent was the program repetitious?

Much too repetitious	Too repetitious	Moderately repetitious	Slightly repetitious	Not at all repetitious

7. In your own words say what you thought of the program. For example, what did you like about the program? What did you dislike about it, etc.?

APPENDIX D

STUDENT TIME CARD

NAME MR. / MRS. / MISS _____

PROGRAM _____ CURRICULUM _____

(Use one card per program)

DATE	START	FINISH	TOTAL HRS. (TO NEAREST 1/2 HR.)	LAST FRAME COMPLETED	DATE	START	FINISH	TOTAL HRS. (TO NEAREST 1/2 HR.)	LAST FRAME COMPLETED

LAST NAME	FIRST	MIDDLE	ADDRESS	DATE STARTED/COMPLETED

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(continued)

SAMPLE STUDENT'S RECORD FOLDER

NAME	AGE	SEX	HIGHEST GRADE LEVEL COMPLETED
	RACE	I.Q.	TESTED READING LEVEL

ADDRESS

EMPLOYER

TELEPHONE

HOURS

PROGRAM_____	PROGRAM_____	PROGRAM_____	COMMENTS
DATE BOOK	DATE BOOK	DATE BOOK	

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(continued)

INITIAL INTERVIEW

Date_____

Name_____Age_____

Home Address_____

Telephone Number_____

Current Occupation_____

Employment Address_____

Working Hours_____

Number of Children_____Ages_____

Last School Attended_____

Date last in School_____

Reasons for leaving School_____

_____

_____

Purpose for returning to School_____

_____

_____

Employment Goals_____

_____

Special Interests_____

_____

Skills or Training_____

_____

Time most convenient for attendance: Days_____

Hours_____

APPENDIX E

PARTIAL LIST OF VENDORS

Addison-Wesley Publishing Company, Inc.
Reading, Massachusetts 01867

Allyn and Bacon, Inc.
470 Atlantic Avenue
Boston, Massachusetts 02210

Appleton-Century Crofts
440 Park Avenue South
New York, New York 10016

Argyle Publishing Corporation
200 Madison Avenue
New York, New York 10016

Behavioral Research Laboratories
Box 577
Palo Alto, California

R. R. Bowker Company
1180 Avenue of the Americas
New York, New York 10036

California Test Bureau
Division of McGraw-Hill Book Company
Del Monte Research Park
Monterey, California 93940

Central Scientific Company
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Chicago, Illinois 60611

Coronet Learning Programs
Coronet Instructional Films
65 East S. Water Street
Chicago, Illinois 60601

Doubleday & Company, Inc.
501 Franklin Avenue
Garden City, New York 10017

Dupont Industrial Training Service
Room 7450
Nemours Building
Wilmington, Delaware 19898

Encyclopedia Brittanica Press
425 N. Michigan Avenue
Chicago, Illinois 60611

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San Pedro, California 90731

Educational Services & Supplies Co., Inc.
261 Athambra Circle
Coral Gables, Florida 33134

(Note: Company representative of Regents Publishing Company and Simon & Schuster, Inc.)

Educational Systems Development
31270 Stephenson Hwy.
P. O. Box 457
Royal Oak, Michigan 48068

The Effective Learning Corporation
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Navaree, Ohio 44662

Entelek Incorporated
42 Pleasant Street
Newburyport, Massachusetts 01950

Follett Publishing Company
1010 W. Washington Boulevard
Chicago, Illinois 60607

General Learning Corporation
Career Advancement Programs
Three East 54th Street
New York, New York 10022

Ginn and Company
Statler Building
Boston, Massachusetts 02117

Globe Book Company, Inc.
175 Fifth Avenue
New York, New York 10010

Graflex Education & Training
235 Park Avenue S.
Suite 1200
New York, New York 10003

Grolier Education Corporation
(Teaching Materials Corporation)
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New York, New York 10022

Harcourt, Brace & World, Inc.
757 Third Avenue
New York, New York 10017

Harper & Row Publishers Incorporated
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New York, New York 10016

Hobart Welding School
Trade Square East
Troy, Ohio 45373

Hope College
Holland, Michigan 49423

Imperial Productions, Inc.
Department K
Kankakee, Illinois 40901

Instructional Materials Availability Center
Office of Instructional Resources
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Chicago, Illinois 60680

Instructional Materials Company
P. O. Box 8065
Greensboro, North Carolina 27410

International Educational Services, Inc.
Division of International Textbook Company
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Scranton, Pennsylvania 18515

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National Education Association
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Prentice-Hall, Inc.
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Tarmax Audio Visual Company
71 North Market Street
Asheville, North Carolina

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Chicago, Illinois 60637

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Los Angeles, California 90024

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